The Builder.

VOL. XLIV. No. 2095. SATURDAY, MARCH 31, 1883.

ILLUSTRATIONS.

Palazzo Contarini Fasan, Venice.—Sketched by R. T. Conder 414
New Schools for the Finchley School Board (Plans, 321).—Messrs. Dunk & Geden, Architects 416
Entrance-door, San Juan de Los Reyes, Toledo (Double-page Engraving).—Senor Alonso de Covarrubias, Architect 418, 419
Triforium Traceries, Lucca Cathedral.—Sketched by R. T. Conder 423

CONTENTS.

Flood, Helplessness, Ruin, and Remedy 401
Canterbury Cathedral 402
Locomotion in London, Under and Above Ground 403
International Municipal Exhibition at Vienna, 1884 405
A Recent Decision on Architects' Certificates 405
Some Hints and Maxims 405
The Holidays 406
The Reclamation of Land 406
Houses in Corea 408
The Historical Development of Ornamental Art 409
Electrical Transmission and Storage of Power: The Institution of Civil Engineers 409
Comparison of Dwelling-houses in the various European Capitals 401
Nottingham School of Art 411
The New Railway Station at Strasburg 411
Maintenance of Main Roads 411
Monuments of Arabian Art in Egypt 412
Copenhagen 412
Monastery of San Juan De Los Reyes, Toledo: Entrance-door of Chapel 412
Sketches in Italy 412
German Sanitary Congress 412
Finchley Board Schools Competition 412
Prize Competition for a New "Northern Museum" in Stockholm 425
Underground Paris 425
The Disinfection and Drying of Inundated Houses 425
The Sun as a Source of Power 425
Panclasite 425
Lunatics in a Prize Competition 425
Fireproof Scenery 426
Edinburgh Architectural Association 426
Sale of Frescos 426
"An Architect on Lawyers" 426
"Wright, of Derby" 426
Southport 427
Extension Works at Fenchurch-street Railway Station 427
Progress of the Mersey Tunnel Railway 427
Prussian Church-Building Statistics 428
The Grosvenor Bridge, Tunbridge Wells 428
Building Patent Record 428
Country Houses 428
Architects' Assistants as Clerks of Works 429
The Decoration of the Dome of St. Paul's 429
The Decorative Arts 429
The Smoke Abatement Committee's Experiments 429
The Street Memorial 429
The Durability of Wood in Buildings 429
Patent Tip Van for Vestries 430
New Buildings on the Site of St. Dionis Backchurch 430
Compensation Cases: Arnold and Morris *v.* The Metropolitan and District Railway Companies 430
Right of Building to Support from Adjacent Land: Field & Co. *v.* Jones & Willis 430
"A Doctor's House, Bedford Park" 431
Church-Building News 431
Stained Glass 431
Books: Amateur Work (Ward, Lock, & Co.); Woolrych's Metropolitan Building Acts (Stevens) 431
Miscellanea 432

Flood, Helplessness, Ruin, and Remedy.

WHEN, we may venture to ask, do things become intolerable in England? Certainly not until long after the time when it has been predicted, or asserted, that such is the case. We speak of that material proof of a thing being intolerable which is to be found in its being no longer tolerated; in the fact of the persons mainly interested setting their shoulders to the wheel, and putting down the nuisance.

Assuredly it might have been thought, ten years ago, that our river floods had attained this intolerable stage. Repeated reports from Committees of both Houses of Parliament have placed on record the vast amount of damage caused, in wet years, by the neglected state of our river valleys. The subject has been so often, and so fully dwelt upon in our pages that it may almost seem as if there were nothing fresh to be said about it. But the present year seems to have surpassed its predecessors in the evil eminence of mischief thus caused. The rainfall of February, chiefly occurring in the first eighteen days of the month, attained a depth of 23·57 in. at Birmingham, according to the trustworthy measurement of Mr. Plant. And the rainfall at Birmingham is, on the average, some 10 per cent. less than that of the mean of the United Kingdom. The fall this year has been 10·13 in. over the average for the month,—that is to say, 43 per cent. in excess of that of an ordinary year; and 5·20 in., or 22 per cent., in excess of that in the wet year 1872, which was 36 per cent. above the average of the five years from 1860 to 1865.

We are all the more moved to say one word more on this subject, of such vital importance as it is to the health and wealth of so large a portion of our fellow subjects, from observing a letter from Algiers, in one of the morning papers, suggesting the necessity of survey as the basis for dealing with floods. The letter is clearly distinct and to the point; but what chiefly strikes us is the apparent unacquaintance of the writer with the fact that the measures he suggests have been, year after year urged on the attention of the Legislature in our own columns and in other journals. For more than ten years we have explained to our readers the necessity of obtaining that information as to the hydraulic condition of our river valleys, which is regarded as indispensable by our Continental neighbours. It is not with us as it is in the United States, or even in many parts of Europe. We have no unruly giants to deal with, like the Danube or the Mississippi. Our longest river has a course of only 225 miles, and in that distance there is a fall of 800 ft. from the source to the mouth. "In the British Isles," says Professor Ansted, "there are only four drainage areas of the first class, each gathering the waters of upwards of 4,000 miles of country, and carrying them to the sea in a single great channel. The Humber, the Severn, and the Thames in England, and the Shannon in Ireland, are all that lay claim to consideration of this character, and it will be found by comparing their drainage areas with those of the great rivers of the world, that in point of magnitude they are all insignificant as compared with the principal rivers of the Continent." According to the best available accounts, the flow of the Thames varies from 26·3 metric tons per second in drought to nearly 400 metric tons per second in flood, and that of the Severn from 7 metric tons per second (at Tewkesbury) in drought, to 682 metric tons per second in flood. The above-stated flood of the Thames is one-fourth of that of the Seine, one-seventh of that of the Tiber, and one seventeenth that of the Po. The ordinary flow of the Danube is 174 times the volume of the ordinary flow of the Thames. When we are made aware of the great efforts that have been made, though not with absolute success, yet with much abatement of the former ravages of the great Continental rivers that we have named, in France, in Italy, and in Austria, what can be said of the state of our own engineering knowledge, or of our public spirit, that allows, year after year, the dwellers in our valleys, traversed as they are by such comparative driblets of water, to be flooded out of house and home?

The effect of each recurrence of disastrous flood, observes a writer in the *Edinburgh Review* (No. 314) is cumulative. As regards the individual sufferers, their health is often permanently impaired, and their powers of resistance to the diseases that damp brings in its train are ultimately broken down. As regards the land, the long presence of undrained water turns rich pastures into hungry swamps, destroying all the finer grasses, which are replaced by semi-aquatic weeds. As regards the rivers themselves, each neglected flood erodes the banks, and piles up fresh obstacles in the channels. The question is therefore extremely urgent, what is to be done?

The scientific reply to this question we have long ago given; nor has any exception been taken to that answer. All scientific men are in accordance on that point. Our first need is to have such an hydraulic survey of our river valleys as to give us the simple facts of the case. Most of the materials for these surveys are already available, and it only requires to arrange what is known, and to add the purely hydraulic observations which yet require to be collected. The cost of such a measure would be far less than the loss to which we are liable in every year for which it is neglected. What, then, is the reason why flood succeeds flood, report succeeds report, and session of Parliament succeeds session of Parliament, while yet we have not advanced a single step towards the first requisite for dealing with our river floods, viz., ascertaining the hydraulic features of our river basins.

We believe that the reason is a simple one. It lies in the jealousy of different classes of landowners, and the desire of each class to pay nothing for work that it may be thought to be the duty of another class to pay for; or, if not their absolute duty, at all events to be chiefly beneficial to that other class. It may seem unworthy, unbusinesslike, unwise; but we think no one can run through the cumbrous library of blue books that has been created on the subject of river floods without coming to this conclusion. And, such being the case, the fact has to be looked in the face. It is of no use to argue, of no use to preach. How is the mutual distrust and suspicion which has prevented improvement and paralysed legislation to be dealt with? If it is not dealt with somehow we shall have to make up our minds to allow the richest grass lands of the island to relapse into bog.

We venture to suggest the lines on which, and on which alone, it can be thought that any measure which Parliament can or will pass as to prevention,—not of floods, but of damage from floods,—must be laid down. We will purposely give a wide margin to our statements, being more anxious to indicate a *modus vivendi* between upland and lowland proprietors, than to insist on any cut-and-dry scheme of our own.

The watering of any river-basin or inland district may be regarded under two aspects,—to wit, that of the beneficial, and that of the injurious, effect of water. In the absence of water, cultivation is impossible. Vegetation refuses to exist. In the presence of too much water useful is replaced by useless vegetation. It is thus the common object of all sorts and kinds of agriculturists,—highland and lowland,—to obtain such a regulated and regular supply of water as may best suit the nature of their soil, and the character of the vegetation which it is their purpose to cultivate.

The proportionate amount of water supply, and the consequent character of the most remunerative kind of cultivation, in this country, is mainly a question of level. It is not so much of the proportionate amount of total rainfall that we now speak (although this is not to be left altogether out of sight), as of the behaviour of the rain when it has fallen. This depends, in some measure, on the geology of a district. But it also depends directly on its levels. Out of every inch of rain, a portion is evaporated, a portion is retained in the soil, or is absorbed by

organic beings, and the remainder runs off, either over or under the surface, to the nearest river outlet.

It follows that, while each piece of land receives approximately a like amount of rain, the low-lying lands receive a much larger amount of water than the uplands. For they receive both the rain that comes down on their own surface, and the unabsorbed rain that runs off from the surface of the higher lands.

Each district, then, is dependent to a certain extent on its neighbours. The higher districts are dependent on the lower districts to carry away their surplus water. The lower districts are dependent on this surplus water for carrying on that more lucrative kind of cultivation which accompanies irrigable soils.

The owners of land on the lower districts, as matter of fact, are more directly called upon to execute works of outfall and drainage than are those in the upper. For however they may complain of the outflow from the upper lands coming upon them, they have to deal with the fact. And as they also have, as a fact, to deal with their own rainfall, they must go to a larger expense than their neighbours if they wish to secure any crops at all. On the other hand, their crops may be made so abundant as amply to repay this larger expense. Of this we can cite abundant proofs from the Severn valley. It would seem, therefore, just and fair that the area of a river basin should be divided into zones of elevation. We will take three, not as insisting on the number, but as a first approximation. We have now existing a line of water carriage from the Thames to the Severn, of which the summit is not quite 400 ft. above low-water mark. If, then, we take zones of elevation of 200 ft. each, we have a primary division of the land. All the land more than 400 ft. higher than the sea is drainable at comparatively small cost, and can be very easily protected from floods, by turning its waters on its neighbours. The zone between 400 ft. and 200 ft. above the sea receives a double, or more than a double, supply of water, the excess of which, in its turn, it throws on the valley between. These rich grazing-grounds, fed with a triple supply of water, make a triple call on the industry of their occupiers, and yield nearly a corresponding return for its exercise.

Subject, then, to more accurate division in special cases, it seems fair that the rating necessary for that drainage of a river basin which can be only efficiently and economically effected as a whole, should be divided into three grades. If the assumed cost of the thorough regulation of the water-shed be 1*l.* per acre, it should be divided, we suggest, into the proportion of 10s., 20s., and 30s. per acre respectively, for the upper, the middle, and the lower levels. The outlay thus provided for should cover all expense that comes under the head of arterial drainage. Thus an upland farmer, who lays his own tile drains 4 ft. below the surface, would have a right to expect an outfall drain to be provided for him that will take off the water at that level. It is true that the greater part of his 10s. may be laid out 400 ft. below the level, and perhaps twenty miles beyond the boundary, of his own land. But it is part of the general scheme, in which he must take his fair share of the burden; and of which the remuneration to him will not be insignificant. On the low-lying owner, again, the direct money impost will be the heaviest. But he must remember, first, that his need is the most urgent; secondly, that he will have the benefit of the expenditure of a great part of the contribution of his neighbour; and, thirdly, that the returns from his own land, if his own industry keep pace with the work carried out by the authorities ruling the scheme, will be more remunerative than that of the less irrigated districts.

We repeat that we do not propose to lay down a hard-and-fast line, or to define, with absolute certitude, zones of level or *pro rata* payments. But we submit to the consideration of those who will make the law, that the above proposal, in its main principles, is just, and that being so, it is feasible. Nothing is more certain than that it is impossible to effect any serious improvement in the condition of our valleys by leaving those concerned to come to an agreement on the subject. As to that, the whole outcome of the evidence of the Blue Books is concurrent and unmistakable. There must be one authority for the entire water-shed, and this authority must have the power to compel all contributors to pay their fair share. All that any one can have a right to demand is that the share should be fair. No one, as a citizen, has the right to refuse to bear his fair share of the burden. It is almost as essential to be defended against flood and the famine and pestilence that follow in its train, as it is against hostile invasion or domestic brigandage. That the land should bring forth her increase, the nation has a right to expect. In the case we are putting, it is our full belief that each class of proprietors would be amply rewarded for the compulsory outlay. Even if that were not the case, there can be no doubt that the nation,—the people of England, as a whole,—would be benefited. The national wealth would be enormously increased by the removal of one of the main causes of its waste. If it should prove that the upland owner only got half of his 10s. per acre added to the value of his land, while the lowland owner, paying his 30s., had his land raised in value by 40s. or 50s., such a disproportion would be better for all parties than their present tax all round. It is the case of the fable of the two cats, the monkey, and the cheese. The cats are the owners, each of whom dreads that the advantage that may be given to his neighbour will be more than that which he will secure himself; the impartially greedy judge is the devouring flood.

CANTERBURY CATHEDRAL.

"Canterbury, the earliest royal city of German England, became a centre of Latin influence. The Roman tongue became again one of the tongues of Britain, the language of its worship, its correspondence, its literature. But more than the tongue of Rome returned with Augustine. Practically his landing renewed that union with the Western world which the landing of Hengest had destroyed. The new England was admitted into the older commonwealth of nations. The civilisation, art, letters, which had fled before the sword of the English conquerors returned with the Christian faith."—*Green's "History of the English People."*

THE enthronement of the Primate of all England at Canterbury turns the thoughts of many to the stateliest and, at the same time, the most ancient of our cathedrals. It evokes some little reflection upon the growth of the Christian faith, whose cradle and nursery in this country must be looked for in that grand metropolitical church which first arose over the rude homestead of a heathen king. Shorn of the splendour and entertainments which attended the enthronement of a Chicheley or a Warham, the ceremony retains all its old significance. As in ages past, the archbishop and patriarch is first conducted in the choir to within the rails, and thence, at the end of the first lesson, to the throne in which he is installed as Bishop of Canterbury. The service concluded, he is escorted from the throne to the historic marble chair, where the bishop becomes Primate, and the induction is completed as, seated, he hears repeated the forms appertaining to his assumption of further dignity,—of redoubled trust. Then, having blessed the congregation from the dean's stall, he proceeds to the chapter-house, where, the chief seat assigned to him as lord archbishop, he declares that he will maintain the rights and liberties of that church, and cause the same to be observed by others in so far as they shall not be repugnant to God's word, the laws and ordinances of the realm, or the prerogatives of his sovereign.

Some years elapsed since the patrician monk of the St. Andrew's Convent, which he had himself founded on the pine-crowned Cœlian Hill, first encountered three fair English slaves from Deira in the Forum of his beloved Trajan, before he could accomplish his cherished design of winning Britain to the Faith. This task he proposed for himself; leaving his convent in secret with a few chosen companions, they had advanced but three days' journey beyond the Flaminian gate when messengers overtook them with the news that a mob had attacked the Pope in St. Peter's Church, and demanded Gregory's instant return. Elevated to the Papal chair, he at length found his opportunity in the marriage of Berchta, daughter of the Frankish king Chariberht, of Paris, to Æscing * Æthelberht, king of Kent. Berchta, whose own great ancestor, Hlodwig, had been converted by his wife Hlotilda, had taken Luidhard, a Christian bishop, from Gaul to her new home. There was assigned to them a ruined Christian church, which she re-dedicated to St. Martin of Tours, beside her husband's palace at Longport, overlooking the high road from Rutupiæ, along which Plautius had led his legions.* Sent forth with forty associates, in spite of all remonstrance, Augustine landed at Ebbe's Fleet, in Thanet, where Hengest had arrived a century before him; Æthelberht, with his queen, stipulating that the Stour should flow between them, and, fearing magic, that no roof or tree should cover them, met the monks stationed on the chalk down by Minster, in the island, whence are now seen, miles away across the marshes, the dim towers of Canterbury. Listening to the Gaulish interpreters, your words are fair, says the king, with native honesty, and your promises,—but because they are new and doubtful, I cannot assent to them, and leave the customs I with my countrymen have so long observed; yet, he adds, I will not deny shelter and hospitality to strangers from a distance, or hinder you from gaining all you can to what you so earnestly believe to be true and good. He gave them leave to cross the ferry to Richborough (Rutupiæ), and formally received the missionaries beneath the cliff of the Roman fortress whose extensive ruins yet remain. Thereupon the band of monks advanced to the capital, one bearing before a silver cross, another the picture of the Saviour, painted and gilded,† chanting the while a Litany that Gregory had composed for the plague at Rome,‡ varied, ever and anon, with the jubilant cry of the older Hebrew worship, which Gregory, with prophetic earnestness, wrested from the name of the Northumbrian king,—Alleluia! Æthelberht gave them first, as a resting-place, Stablegate, by a heathen temple near the present church of St. Ælphage, and soon allowed them to worship with the queen at St. Martin's.§ There, within a few months, he was himself baptised on Whitsun-day, June 2nd, A.D. 597, and, as some would affirm, in the venerable font preserved in the church. He gave the holy band a temple, which Augustine dedicated to the child saint,—St. Pancras,—martyred under Diocletian, and, moreover, himself retiring to Reculver, yielded to Augustine his own wooden palace and another neighbouring temple, with its grove, within the city walls, whereon to found a new cathedral to be consecrated to Christ. Augustine, appointed archbishop of Canterbury, obtained more missionaries from Rome, of whom Justus was to found the see of St. Andrew at Rochester, Mellitus that of St. Paul in London, and Paulinus that of St. Peter at York. Of his own original companions Lawrence succeeded him as archbishop, and Peter became first abbot of St. Augustine's. Finally, Æthelberht granted to Augustine a plot of ground by St. Pancras for the monastery of St. Peter and St. Paul, that subsequently grew up into the great abbey known by his name, and which, by the liberality of Mr. A. J. Beresford-Hope, was some years ago re-established as a college of missionaries to our Colonial church. This was beyond the city walls for the reason that whilst Augustine "desired," in the words of Dean Stanley, "to have in this land of strangers a spot of consecrated ground where his bones should repose after death," intramural sepulture was forbidden by the usages he brought from Rome. And here he was buried A.D. 604,—in a spot by the Roman road where now stands the Kent and Canterbury Hospital,—and soon after Berchta with Luidhard were laid by his side. On the completion of the abbey (it was consecrated A.D. 613 by Lawrence and Æthelberht) his body, with those of the queen and her chaplain, was removed into the church, whither, after a reign of forty-eight years, the first Christian Brehtwalda was carried from Reculver, to be buried by his first wife on the north side of St. Martin's altar, in the church of St. Augustine.‖

Christ Church did not escape the troubles of the times. Repaired by Odo, A.D. 938, both it and the city were burned by the Danes, who, bringing a large fleet to the mouth of the Stour (or Wensome as that part of it was then called), carried away St. Ælphage, archbishop, whom they murdered at Greenwich (April 19th, 1011), where a church distinguishes the spot of his martyrdom. King Cnut restored the ruined minster, giving it, with more substantial benefactions, his golden crown, which the monks retained until the Dissolution. Within a few

* "Son of the Ash-tree," a name given to the dynasty of Hengest.—*Bede*, ii. 5, sec. 101.

* Legend traces the origin of this church, with those of St. Mary in the Castle at Dover, St. Peter's, Cornhill, West Minster, and Winchester, to King Lucius. Confer Ussher's "Eccl. Brit. Antiq."

† "Formose atque aurate."—*Acta Sanctt.*, 326.

‡ H. E. Fleury, book xxxv. 1.

§ Thorn, 1758.

‖ Thorn, 1767; Bede, ii., secs. 100, 101.

months of the Conquest, a fire ravaged a city which then surpassed London in extent and importance. Lanfranc began to rebuild the cathedral, and secured the see's superiority over York. Part of the crypt and two small square towers,—St. Anselm's and St. Andrew's,—by the east transept are shown as his work, which was carried on by Prior Conrad and by Anselm, his successor. At their hands the church assumed the form which inspired William of Malmesbury's panegyric,—"Nothing similar was to be found in England, either for the brilliancy of the painted windows, the splendour of the marble pavement, or the pictured roof which attracted the eyes of beholders." Rededicated to Jesus Christ by Radulphus de Turbine (1114-1122), we have a description of the building from the pen of Gervase, a monk of the adjacent priory of Christchurch. Speaking of Prior Conrad's choir, Gervase, in the "Decem Scriptores," gives details of the magnificence which was reported on to King Henry as an example of profusion and waste of his liberal donations. With the unbounded veneration for the church that characterised his age, that sovereign replied,—"If those treasures have contributed to the increase and glory of the house of God, blessed be the Lord that he has inspired me with the will to grant them, and that he has bestowed such grace upon my reign that I am permitted to behold the increased prosperity of my holy mother the church." In the choir, as rebuilt ninety years after Lanfranc's time, we have a striking exponent of the improvement introduced into ecclesiastical architecture. Amongst the more remarkable features of difference set forth in the comparison made by Gervase may be instanced these following. The pillars of the new choir are of the same form and thickness as the old, but are 12 ft. higher; their capitals, instead of being plain, are richly yet delicately carved, whilst they include marble columns which did not exist in Lanfranc's work. The stones of the former arches had been cut with an axe; these, of the Early English style, are chiselled. The old vaulting was plain; the new is pointed, with key-stones and bosses. The choir ceiling, flat and ornamentally painted, like to that of St. Alban's, gave way to one elegantly arched with ribs of hard stone, and a light fine stone for the interstices. Again, whereas there ran but one triforium around the former choir, this is beautified with two. Thus, before the close of the twelfth century there was not to be found a member of the *soi-disant* Anglo-Saxon architecture in the whole chancel and choir of the church, except, indeed, in the main arches of the crypt (the most spacious in England) where it is probable the round arches were expected to give a stronger support.

For a whole year after the assassination of Thomas à Becket the cathedral was desecrated; the bells were fastened up, the pavement torn up, the hangings and pictures removed, and dirt suffered to accumulate. Fire interposed to complete the expurgation, the choir and surrounding fabric being reduced to ashes on the 5th day of September, 1174. During the interval 1175-1180, Richard being then archbishop, the whole was rebuilt under the superintendence of William of Sens, who borrowed largely from his own cathedral, and another architect, William, the first English architect of whom anything is known. Soon afterwards the monks set about the erection of Trinity Chapel, with the round tower adjoining, though the division which, fomented by the Pope, arose between them and King John on Hubert Walter's death interrupted their labours. On Tuesday, St. Thomas's fatal day, the 7th day of July, 1220, in the presence of "King Henry the young child," the Cardinal Archbishop Langton, the legate Pandulph, bishop of Norwich, the Archbishop of Rheims, and the celebrated Hubert de Burgh, with "four great lordlings, noble men and tried," bore the martyr's body from its grave in the crypt behind the altar of the Virgin to the high altar eastward of the patriarchal chair and immediately over the grave,—a shrine which thenceforward formed the object of pious pilgrimages "from every shire's end of England," and, indeed, all Christendom. Celebrated with prodigious pomp, circumstance, and expense, the Feast of the Translation, with its survival "Becket's Fair," has long since ceased to be observed, but its memory will live until Chaucer, with his "Canterbury Tales," shall be forgotten.

St. Anselm's Chapel at the eastern end of the southern side is conspicuous for its large window, enriched with beautiful tracery of the fourteenth century; beneath is the fresco-painted chapel of St. John the Evangelist, rarely shown to visitors. In the "Martyrdom," containing the door which formed the ordinary entrance from the cloisters,—and whose position, on the northern side, indicates the British origin of the church,—Margaret of Anjou was united to King Edward I. The exquisite window in this transept, the gift of King Edward IV., was almost entirely destroyed by the fanatic Richard Culmer,—"Blue Dick,"—thrust by the Parliamentarians into the office of one of the six preachers who, in his own phrase, set about rattling down proud Becket's glassy bones. The window, even in its present condition, is of especial value as presenting authentic likenesses of the king, his queen, and daughters, King Edward V. and his brother the Duke of York. The doorway, from without, was constructed by Prior Eastry (*temp.* Ed. I.), to whom the finely-sculptured choir-screen also is due. Simon of Sudbury, beheaded by the rebels in the year 1381, commenced the rebuilding of the northern transept and of the nave, the latter being completed under Chicheley (1414-1443) by Prior Chillenden. The central or "Bell Harry" tower, outrivalling those of Gloucester and York, and once styled the Angel Steeple, being surmounted by a pinnacle carrying a gilded angel, was erected by the building-loving Cardinal Morton and Prior Thomas Goldstone, the second of that name (Hasted, iv., 556). This Goldstone (prior 1494-1517) designed the gate at the Close entrance. Arundel's tower (*circa* 1390) at the northern corner of the western end no longer appears as seen in Hollar's print. The lofty lead-covered spire was burned in the year 1704; and forty years ago the tower was restored by the dean and chapter, under the care of the late George Austin, cathedral architect, as a counterpart of the south-western or Chicheley tower. Whence the easternmost apse obtained its name of Becket's crown cannot with certainty be predicated. It is said to have occasionally contained the scalp or crown of the saint, enshrined as a relic, that was severed by Richard Le Bret's sword. To this derivation Mr. Way inclines; whereas in his History of Canterbury Cathedral Professor Willis would treat it as an architectural term. The apse itself, as Gervase tells us, was raised in the year 1180, though not completed until the middle of the last century at the bequest of Capt. Humphrey Pudner. There were three objects of especial veneration by the pilgrims: the *caput beati Thome*, the *punctum ensis* in the Martyrdom, the *feretrum* in the chapel of Holy Trinity. Each had its own altar, to which the Black Prince bequeathed tapestries by his will.* In his account of a visit which he made with Colet, dean of St. Paul's, to Canterbury, Erasmus states that the *caput* was shown to them in the crypt. It is worth notice how on this occasion the course of coming events is foreshadowed in the little reverence Colet displayed not only over the relics shown to them by Prior Goldstone in the cathedral, but at the lazar-house of Harbledown hard by. Eight years later Warham received at the western door the Emperor Charles V., Cardinal Wolsey, and the King Henry VIII., who, but for his elder brother's death would have been Primate: eighteen years had not passed before sentence was pronounced (June 10, 1538) at Westminster against the dead archbishop, his bones were to be burned, the priceless offerings at his tomb forfeited to the Crown.

Amongst the earliest recorded visits to St. Thomas's shrine are those of King Henry II. and Louis VII. of France; the last is that, on the 31st of August, 1538, of Madame de Montreuil, who had just attended Mary of Guise to Scotland. The month following Dr. Leyton and his destroying commission arrive at Canterbury. The mortal remains are scattered to the winds, eight men† scarcely suffice to carry off the jewels and gold in two coffers, six-and-twenty carts wait at the church-door for the rest of the spoils.‡ The "Regale of France," bestowed by Louis, was long worn by the king in his thumb-ring, and is last heard of among the precious stones of his daughter Mary's golden collar.§ The posthumous miracles of Becket are represented in the windows of Trinity Chapel, and in one of the north side is a picture of the shrine or *feretrum* itself, being a group of the Saint appearing to the monk Benedict. Another drawing,—showing it covered with the wooden canopy,—exists on a folio page of the Cottonian MS., Tib. E, viii., fol. 269. This is copied, but inaccurately, in Dugdale's "Monasticon" and Nichols's "Erasmus." The shrine, ark-shaped and containing an iron chest which held the boxes, rested on a marble platform supported by six pillars, the space between these, as in the shrine of St. Eadward the Confessor, being open, so that crippled and diseased votaries might be placed in closer approximation to the martyr's body. On one side of the spot where it once stood,—now marked only by the broken purple pavement,—lies the hero of Créçi, Poitiers, and Nejara, with whose death the hopes of Englishmen died too, who directed by his will that he should be buried in the undercroft "où le corps du vray mastir Monseignour Seint Thomas repose" (and in which he had founded two chantries at his marriage), but whom they placed in the venerated ground above. On the other side rests he who as a little child witnessed the funeral of the Black Prince, whose son he was destined afterwards to overthrow.

* L'autier là où Mons'r Saint Thomas gist,—l'autier là où la teste est,—l'autier là où la poynte de l'espie est.

† Stow's Annals, 1

‡ Sanders in Wilkins's Lore, iii. 836.

§ Nichols's "Erasmus," p. 224.

LOCOMOTION IN LONDON, UNDER AND ABOVE GROUND.

AT a time when, as referred to in our issue of the 17th inst. (p. 337, *ante*), public attention has been so eagerly directed to the working of the underground system of London railways, much interest attaches to all experiments, or feasible projects, for substituting some other motor power for the present ponderous locomotives, which are mechanically so triumphant, and on physiological grounds so objectionable. For this reason the trials of electric motors, such as that reported on the West Metropolitan Tramway between Kew and Hammersmith, demand more than the mere reproduction of the account furnished to the daily press.

We have before this expressed the gravest doubts whether it could ever prove feasible regularly to propel trains of carriages by electric power, so long as it was attempted to do this by direct transmission of force from a stationary dynamo-motor. The objections, it seems to us, are not of that class which we may expect further applications of skill and science to remove, but of that character which is in itself almost insuperable. Thus the laying down through the country on the ground, or even the suspending from poles, in the rude mode adopted by the telegraph companies, of lines of electric conductors, the slightest contact with which might involve sudden death, has always seemed to us an expedient that no argument could justify. Again, the loss of force, either as considered in relation to the resistance offered by the conductors in proportion to their length, or from that electric leakage which increases so rapidly with the intensity or dose of electricity sent through a given conductor, must always, it would seem, put a sharp limit on distant transmission, except in cases where the power obtained is supplied so freely by Nature as to allow of the waste of a very large percentage in order to send a small portion to a considerable distance. These two objections are, we think, independent of detail, and are of a nature that it is folly to despise.

With the use of accumulator batteries, on the other hand, these objections to electric propulsion disappear. It is in this direction, therefore, that we look with the greatest anxiety for the outcome of inventive labour. We are not in possession of the data of the experiments made publicly on the 10th of March; and it is obvious that it is one thing to run a tramcar for a mile, and another to prove the mechanical and financial success of any given invention. But we hope for further particulars.

There is, however, one point to which we wish to call the attention of all those interested in electric propulsion. It is a point which it is the duty, as well as the interest, of the electric engineer to clear up; and, moreover, it is one as to the clearing up of which we recommend all our friends to be quite certain before they venture on any electric propulsion scheme any money that they cannot afford to lose. We refer to the question how much energy is lost in the double process of the accumulation of power and of its impartation to motive purpose.

In all forms and descriptions of the exertion of mechanical power there is constantly going

on a waste of the nature of leakage. In the most perfect of all locomotive machines, that is to say the living animal, this leakage is so utilised as to emphasise the beauty and poetry of nature. What are the gambols of the kitten, the rabbit, or the lamb; the circling gallop of the dog, when taken out by his master; the dash of the dolphin through the surf, the frisk of the squirrel on the bough, the songful soaring of the lark, the very dance of the gnats on the sunbeam,—but the leakage of vital energy,—the blowing off of that animal steam, which, not being required at the moment for the duties of life, is devoted to enhance its enjoyment. In the young of all creatures this exuberance of power is found, and its display constitutes one of the charms of youth. When the aged stag-hound, the pensioned charger, the infirm old man, economises the little strength left him for the slow performance of only indispensable motions, this waste of power is over, but over with it is the enjoyment of the sense of vigour, and the display of the poetry of motion.

In mechanical motor power there is no youth, no enjoyment, no sense of beauty, except in so far as we measure the exact proportion of means to end, and admire the scientific exactitude of the balance. Leakage, then,—to generalise a word originally applied only to the escape of fluids from a containing vessel,—is an unmixed evil in mechanics. It is also an evil of very great magnitude; although we have done very little to measure it. In the wooden sheathing of the boiler of the locomotive we observe an attempt to stop a leak, that of heat; and the engineer is aware of the economy of "jacketing," and its effect on the available power of an engine. But of all the heat liberated by the combustion of coke in the furnace of the locomotive, how much is lost by radiation or by conduction? While the engine is waiting in the yard, with dampers down, and fire banked up, still this leakage of heat goes on. So it does in every kind of mechanical work. Whenever we meet with friction, with interruptions of the steadiest and smoothest motion, with the application of a brake on a railway train, of a paul in a windlass, there is wasteful leakage of heat, and there is loss of power in that definite form.

Even in the impalpable energy of light we see the operation of the same law. Light loses its intensity by reflection, loses by each successive reflection, can actually become extinct or invisible by dint of numerous interferences with the direction of its inconceivable speed of ray. We can not trace how the loss arises, but it is as mensurable as the loss of heat by radiation or conduction.

The point in which this well-known loss by leakage bears on the question of propulsion (beyond what is usually well known) is this. What is the loss of energy involved in passing a given amount of dynamic force into an accumulator? What is the loss incurred on returning this force from its chemical to its mechanical condition? Be it much or be it little, there must be such loss. And, so long as it is unmeasured, it is impossible to say how far it may invalidate the results which the engineer hopes to secure by the use of the accumulator battery.

Anticipating, as we do, great results from the accumulation of energy, results which will be all the sooner attainable if electricians will set themselves at once to reply to our above inquiry as to loss by accumulation and distribution, we can hardly expect much light to be thrown on the problem of underground locomotion from this source. Every one now is offering some nostrum for the performance of a task that takes the highest ability of the most experienced engineers. Compressed air, electricity, funicular traction, are all advocated in the daily press as if they were new discoveries, which it only needed a little ordinary care to make available to supersede the present locomotives. We do not hesitate to say that most of these recommendations betray an equal ignorance of mechanical law, and of the history of invention. Of the use of compressed air, not, as it is incorrectly termed, as a motor power, but as a transmitter of motion, we have before spoken with some detail (see vol. xliii. p. 387). In this case, as in that of the atmospheric railway, the leakage of heat is so great as to put a very sharp limit to the purposes to which this very elegant mode of transmitting power can be economically applied. But in the working of the Metropolitan Railway we have a problem of extreme difficulty. It is one that we consider to have been very ably solved in a mechanical point of view, though it still presents great difficulties in a sanitary or physiological point of view. But it is idle to attempt to trifle with the case, or to suggest motors or transmitters of power which a little judicious investigation will show to be utterly inadequate to the work to be done. That work is equivalent at the very least to a run of forty miles, at forty-five miles an hour, with a weight of 160 tons. The difference between the actual distance from terminus to terminus and the distance we have named, and that between the running speed actually maintained and the maximum attained between the stations is taken out in destructive friction in that rapid starting and stopping at each closely neighbouring station, without which the Underground Line could not compete with the street omnibuses. And if our readers will refer to the very interesting discussion on modern locomotives which is continued in volume xxxvii. of the Proceedings of the Institution of Civil Engineers, they will see the horse-power of the engines that perform about the same amount of work as those on the Metropolitan line rated at 678 horse-power. Taking the same *formulæ*, and allowing for 160 tons, at forty-five miles an hour, up inclines of 1 in 100, we obtain a higher resistance than that of the Great Northern engine here cited, or 748 h.p. So that those persons who would replace the potent force of coal for propulsion must be prepared to show their command, from other means, of a force of from 600 to 700 h.p. for their machinery.

Now it will be well for those who propose either electric or compressed air apparatus to set before themselves, in the first place, this great power as required to be maintained for at least an hour. We must then calculate what weight and bulk of accumulation, whether in the form of battery or of reservoir, will be required to supply it; and we think that the outcome of a few figures will tend materially to check any very sanguine hopes that may be entertained as to the practicability of the change. And in either the one case or the other the inventor must be prepared with an exact measure of the loss of power by leakage of heat, or by conversion of the form of energy.

Another mode has been suggested with the utmost confidence by some one who is apparently but ill-acquainted with the actual history of funicular traction on railways. Two of our Metropolitan lines, within our own personal knowledge and remembrance, were designed for traction by ropes. The traffic was thus conducted, in each case, for a time; and then the whole capital laid out in engines, drums, sheaves, ropes, and other appliances was written off, and recourse was had to the locomotive, which has ever since been used. The two lines are the London and North-Western, from Camden-town to Euston-square, and the London and Blackwall; and the change has been made from practical necessity, in spite of the fact that rope traction is considerably cheaper than locomotive traction.

The main practical difficulty which all the skill and ingenuity at the command of the fathers of the railway system were unable to overcome, was due to the constant twisting of the rope, which finally twisted itself in two. Hemp ropes and wire ropes were equally unequal to this destructive strain, nor were any means found of obviating the evil; and here comes the conclusive disadvantage, that one fracture,—one bit of the long train of connexions out of order,—and the whole line comes to a standstill. This is a difficulty which must, in all probability, prevent any stationary generation of power from coming into competition with the locomotive on busy lines.

And even if the mechanical difficulty could be overcome, there exists another, which cannot fail to prove fatal to the application of any form of stationary power to the Metropolitan Railway. From the Mansion House Station to Aldgate occur sixteen stoppages, including that at the latter terminus. The time occupied in the run, we find from the time-tables, to be sixty-one minutes. If this line was worked in two divisions, which would incur some little loss of time, but which may well be regarded as an indispensable measure, we should have something not so very different, in each of them, from the Blackwall line, which was 3·75 miles long. As to power, we see no difficulty. But how would the line work? At present there is a train about every five minutes. This is three times as many as were run on the Blackwall. But that is not the point. The mode of working would be this. At the moment when the engines start, if we take a train from Aldgate, there will be a carriage standing attached to the rope at each of the platforms at Bishopsgate-street, Moorgate-street, Aldersgate-street, Farringdon-street, King's Cross, Gower-street, and Portland-road. On the supposition that the line is divided at Baker-street, there would also be eight carriages attached to the rope at Aldgate. When the engines were put in motion, first the Portland-road carriage would arrive at Baker-street, while at about the same time carriage No. 8 would be disconnected from the rope and stopped by its brakes at Bishopsgate-street. In the same way one carriage would run into the terminus, and one be dropped on the line, station after station, till the eighth carriage came in to Baker-street. That is all very well for those persons who wish to go from either of the above-named stations to the latter terminus. But how in the case of any one wanting to go from Farringdon-street to King's-cross? He could only do so by going either to Aldgate or to Baker-street, and then returning to King's-cross. This, it is needless to say, is out of the question. The passenger would go by omnibus. He could walk in less time than he could make this roundabout journey. It will thus be seen that, apart from any mechanical difficulty of traction, the impossibility of going from one intermediate station to another by any arrangement for funicular traction puts this method entirely out of the question for any part of the Metropolitan Underground System.

A private member of Parliament is endeavouring to introduce a Bill to render it imperative on the railway companies to "consume their smoke" on the subterranean lines. If there be the ground for this Bill that any smoke-burning engines now ply on any of these lines, such a measure has our hearty support. But as far as we are aware this is not the case, with the exception, perhaps, of some of the goods trains. We quite hold that smoke-producing locomotives should not be allowed to run through the tunnels. But the smoke is a preventible evil, and it has the great advantage,—in the point of view of those who would prevent it,—of being a visible and detectable evil. Not so with the mephitic vapour which is the real trial to the lungs of the passengers. This, partly consisting, probably of steam, partly of carbonic acid and other allied gases, is the direct outcome of that combustion by which the heat that moves the train is liberated from the fuel. We do not see how this product is to be dealt with, except by ventilation. So vast is the amount of duty expected from the locomotive that, in the present state of our science, it can only be accomplished by the production or liberation of heat, second after second, during the trip. But just in proportion to this conversion of the heat stored up in the fuel into motion, is the production of noxious gas. We may regret the fact, but we cannot alter it.

We have spoken of the magnitude of the work actually done on the metropolitan underground lines, as very considerably complicating the case, where any attempt is made to interfere with existing arrangements. The marvellous command which, by the powerful 42-ton engines, is attained of speed, and the almost incredibly short time in which a train of 160 tons is started and stopped, are points which it may well be regarded as impossible to secure if any lighter engine were used, although the weight of the engine is altogether disproportionate (but for this consideration) to that of the train. Again, notwithstanding the manner in which the carriages are crowded at certain hours of the day, the proportion of dead weight to net weight conveyed must be something like 18 or 19 to 1. The question of the capacity of any given line of communication is one to which the investigation of the case for the Manchester Ship Canal has caused much attention to be given. Not less, we are prepared to show, than 12,000,000 units, or tons gross of load conveyed for a mile, per mile of line, is the annual amount of tonnage which the Metropolitan Railway now conveys, being equal to 37,000 unit tons per mile per day. Of this, not more than 2,200 mile tons is the net load of passengers. The rest is the weight of the carriages alone, to which at least 30 per cent. more must be added for that of the engines. Thus the disproportion between the weight actually transported and the weight of passengers carried, is very great. If we suppose a steady movement of four passengers abreast marching Cityward,

and at the same time an equal number marching westward, along a street, the flow or movement of weight would be about equal to the average flow of weight of passengers over the Metropolitan lines. This is at the quick-march rate, of 108 steps in a minute. If we suppose this great host to move at double-quick time, which is, perhaps, nearer to the ordinary hurried tread of the Londoner, we should have 3,464 tons per day of 12 hours, on foot, against 2,200 tons per day of 18 hours by the railway. As compared with the quick-march rate of three miles an hour, there is more than a fourfold gain in time over the whole distance. But when we take shorter distances, and allow for the time requisite for taking tickets, going downstairs to the platform, waiting for trains, and again losing space and time in emerging to the outer air, it will be seen that the saving of time effected by the use of the underground railway is not always proportionate to the immense cost, both of capital laid out and of dead weight moved, at which that gain is secured.

We mention these important facts, not in any way as depreciatory of the service that has been rendered to London by the engineers of the Metropolitan Railway. On the contrary, we think that the skill, science, and care displayed on the plan, construction, and working of these lines, are such as to deserve far more marked public acknowledgment than they have yet received. We apprehend that the names of Mr. Fowler, Mr. Tomlinson, and Mr. Fenton are those most intimately connected with the successful working of a line which stands alone among public works for the safety to human life with which, regard being had to its celerity and enormous traffic, it has been conducted. Our object has been to show how great have been the difficulties overcome, how serious is the problem thus solved, and how idle and unconsidered are some of the proposals now so confidently brought before the public.

On the other hand, it cannot be denied that the margin of cost, and of unproductive work, is so enormous that it would ill become the engineer to say that science has spoken her last word on the subject. It is a very remarkable fact that both the actual cost per passenger, and the return to the shareholder on the capital invested, are very nearly the same on the Metropolitan Railway, by the London General Omnibus Company, and on the average of the tramways of the United Kingdom. On the railway, the average receipt is 1·80d. per passenger, on the tramways it is 1·93d. per passenger, and by the Omnibus Company 2·29d. per passenger. On the railway, the working costs, in 1878, were 35·62 per cent. of revenue; and they have, we think, been somewhat reduced since that date. On the tramways, the percentage of working costs, in 1881-2, was 80·8 per cent. of revenue. On the omnibus lines they were 94·16 per cent. But the amount of interest on capital by these different routes so far counterbalances the mechanical facilities acquired by the outlay, that while the railway, and the tramway, each returns 5 per cent. dividend, the net profit earned by the omnibus company (last year) was 8·50 per cent. on capital.

It is only by the patient, steady, conscientious accumulation and collection of facts like these that either the man of science or the man of business can arrive at a clear knowledge of the laws that regulate transport, whether of passengers or of freight, and can become able to offer an opinion that shall be of any value on any of those great questions which are now about to be brought under the notice of Parliament.

INTERNATIONAL MUNICIPAL EXHIBITION AT VIENNA, 1884.

A NOVEL kind of exhibition is to be held in Vienna in the summer of 1884. It is to consist of a collection of drawings, &c., showing the results of the labours of the municipal authorities of various places in the way of sanitary and other improvements; a collection of articles, implements, and so forth employed for these purposes, and likewise publications on the history of cities. At one of its last sittings the Vienna Town Council agreed to make a grant of 100,000 florins to defray the expenses of the exhibition which it is proposed to hold in the great Rotunda, which was built by the late Mr. Scott Russell, and in which the International Electric Exhibition of the coming summer is also to be held.

A RECENT DECISION ON ARCHITECTS' CERTIFICATES.

THE law courts have again and quite recently been discussing a case which is of considerable interest to all who are concerned with building matters. It shows also very conclusively that the tendency of the law is to consider an architect's certificate as final when it is possible to do so. As a general rule, this principle acts most against builders, for the question usually arises when architects have not included some extras in their certificates. In the present instance it was the builder who relied on the certificate and the employer who contended that it was not final. This case seems also to show the extreme folly of parties to building contracts not adhering to the forms authorised by the Builders' Society and the National Association of Master Builders of Great Britain. These are clear and well known, and although many solicitors have pet forms of their own, every builder ought to insist on the use of the authorised conditions. It may be said that in the present instance the affair has turned out all right for the builder. This is true to a certain extent, but he has had all the extra cost and the annoyance of litigation in order to substantiate his claim.

The case to which we refer is that of Richards *v.* May, which came before a Divisional Court of the Queen's Bench Division on March 8th, and is reported shortly, but sufficiently at length for the purpose of our comments, in the *Law Journal* Notes of Cases for 1883, p. 36. It will be also found at p. 50 of the *Weekly Notes*, which, as being published by the Incorporated Council of Legal Reporting, might be expected to be the best publication, but, so far as this case goes, it is inferior to the *Law Journal* notes.

The question arose in this way. Mr. Richards, a builder, contracted to erect, for Mr. May, two villas in accordance with certain plans and specifications prepared by one Lethbridge. In the contract these two provisions occurred. "All extras or additions payment for which the contractor shall become entitled to, under the said conditions, and all deductions which the proprietor shall become entitled to, shall be respectively paid or allowed for at the prices as shall be fixed by Mr. S. J. Lethbridge, the surveyor appointed by the proprietor." Then there was also the following:—"The contractor to be paid on the certificate of the surveyor, at the surveyor's discretion, during the progress of the works in payments on account at the rate of 85 per cent. value of works executed, and the balance of such contract to be paid at the completion of the works to the surveyor's satisfaction." After the work had been completed the surveyor gave a final certificate by which it appeared that the builder was "entitled to receive the sum of 875*l.* in settlement of contract and for extras and omissions." In this certificate were the detailed items of the extras measured and valued, and omissions also measured and valued. But the employer—like many employers,—was disinclined to pay the amount which the builder stated to be due to him, and declined to allow that the surveyor had any jurisdiction to decide what were extras and omissions, although he admitted he had authority by the contract to fix the prices at which extras and omissions should be allowed. It must be obvious that this defence was possible from the want of clearness in the contract, and that if the latter had stated, as it might well have done, that the surveyor should include in his final certificate the extras and omissions, then there could have been no doubt at all on the subject. The certificate would on the face of it have been final, and the rule expressed in the well-known case of Goodyear *v.* The Mayor of Weymouth (Roscoe's "Digest of Building Cases," second edition, p. 24) would have clearly been applicable. As we have already said, the Court determined in favour of the builder, and they did so on this ground that (we quote the words of the epitome of the judgment) "as there was no clause in the contract providing any other mode determining what were extras and omissions, and as the surveyor was empowered to fix the prices at which extras and omissions should be allowed for, the parties must be taken by necessary implication to have agreed that the surveyor should determine whether the items appearing in his certificate were properly extras and omissions." We confess that this seems to us somewhat in the nature of a happy thought to justify a decision which was clearly in favour of the party who was seeking to enforce a rightful claim. For, although a surveyor may fix the rates at which extras shall be allowed, is it not quite possible for the parties to mean the decision as to what are extras to be that of an arbitrator, and not of the person who has had the ordering of them? We mention this because the reasoning of the judgment does not appear quite clear, and we wish to make it very evident that persons engaged in building transactions should have their contracts clearly drawn. Nothing is ever gained by using either short or fanciful conditions.

SOME HINTS AND MAXIMS.

A HOUSE in danger, a family in peril.

Shore up carefully if you would pull down safely.

Sharpen your tools properly and you will husband your strength.

Hit the nail straight upon the head and you will save many crooked blows.

Build with seasoned timber or you will build to your own discredit and others' loss.

Set out your work with accuracy, and the time you will save will bring profit as well as credit to your employer and yourself.

The mason should work the stone to the lie of the stratum, and bed it to the same.

The builder that deceives the architect wrongs the client as well, and if he connives at bad workmanship he demoralises the workman and constitutes himself a criminal.

Garden mould may be good for vegetables, but as a component of mortar it spells early ruin.

Glaze your sashes with putty if you will, but make your mitres and other joints without it.

In taking out building quantities do not overtake them too much, for you may calculate too liberally for your own good, as well as estimate by guess work too lowly to your own and others loss.

Good workmanship needs no coat of paint to enhance the execution, for like sculptor's work wood workmanship is best judged in the nude without drapery or colour.

If you would set out good work, do it by practical geometry; if indifferent or bad, by the "rule of thumb."

In planning stairs think of your head-room from the lowest starting-point to the highest landing, or somewhere in ascending or descending stunning falls and broken limbs may accompany bruised foreheads and battered hats.

Perspective is necessary in drawings; but do not carry its principles into practice in putting together workmanship.

Plaster-work has little heart beneath it, but plenty of ribs, and its whole soul is in its surface enrichments, like many of our fashionably-attired ladies.

Build plumb, and if you err at all let it be in against the carcass, and not out against the body politic.

Wet your bricks, wash your sand, slake your lime, but perish not your mortar with water, or your work will not be worth its bond.

Do nothing in building by guess-work, and in its conduct trust not too much to memory, for a jotting or two at the proper time are worth a hundred jogs on the brain, for the purpose of safe recollection.

Let no building workman be too proud to take a hint from the humblest labourer that attends him, for the experienced looker-on betimes sees more than the doer.

Houses may not be built from the roof downwards, though they are often burned in that direction by plumbers' fires.

If this were a Pagan era, stoning a builder to death who consciously built a bad unhealthy dwelling, would be an appropriate punishment. It would not be inconsonant with Christianity and justice to compel a builder to live in the worst of the houses he built for others.

A fair day's work for a fair day's wages should be estimated by its quality as well as its quantity.

Contrary to the old saying, "a carpenter is known by his shavings," he is known by the character of his work; and the state of his tools may be judged by the same standard.

Artificial, like natural, drainage, is governed by gravitation, and the absence of a proper fall in either is as opposed to nature as a swamp is to health.

The more irregular the outline of your walls, the more unsatisfactory and expensive your roofs, and in this view, remember, in planning, that next to a good foundation there is nothing of more importance than an efficient covering.

Master your trade, but do not let a pride in special or expert knowledge overmaster you, for the pedantry of the workshop or laboratory is as offensive as the pedantry of the school.

The workman that makes the most noise will be often found doing the least work, and doing it badly.

A kitchen and its belongings should not be planned solely for the comfort or ease of the cook, but for the general health of the household, for the purer the air below the purer will that be which circulates above.

Plan the attic story for bedrooms if you will, but do not stow the servants in a cock-loft between the ceiling joists and the slates, which will be a frying-pan in the summer and a refrigerator in the winter,—a choke-room instead of an air-space.

No matter how well arranged, water-closets immediately within a dwelling are objectionable. The minimising of the evil partly lies in keeping them as far as possible from the sleeping-rooms.

The majority of our modorn chairs are not made for bearing the weight of the human body, but for ornament, and were not a compensating balance established by the position of our feet, the balance of sustaining power in the chair would be soon exhausted or overturned by a serious dismemberment.

Builders' horses are stable factors in the contracts, and like the workmen they have an interest in the extension of the "extras."

A clerk of works, though he should be the architect's true representative, should not be the contractor's wanton obstructive. To manufacture trivial faults on the one hand is to provoke artifice and concealment on the other, and naturally foreman and workmen will side with the employer, and as a consequence both architect and client are damaged in the struggle.

Moral principles and commercial honesty must accompany technical education, or the buds will produce few healthy blossoms, and the latter less good fruit.

THE HOLIDAYS.

As so many of our readers are affected by the holidays, it may not be amiss to express our strong opinion that the time has arrived for an effort to be made to have the Easter and Whitsuntide holidays fixed for particular seasons in the year. The object of holidays is to add to the enjoyment and the health of our working population, whether they be manual or mental labourers, whether they be clerks or members of Parliament. But in a perfectly irrational manner we fix two of our most important holidays,—those called the Easter and Whitsuntide holidays,—at the same time as certain Church festivals. The consequence is that, as happens this year, Easter falls so early that the secular holiday is not only spoiled, but in many respects wholly prevented in the case of persons who are not robust or who are young and tender. The whole face of North Wales, for instance, was covered with a deep snow, and when it is remembered that North Wales is the playground of hundreds of workers from Liverpool and Manchester, the absolute loss of a holiday to them may be at once imagined. The importance of securing, so far as we can, fine Easter and Whitsuntide holidays, is perhaps more important in the interests of the lower middle classes than is at first supposed. For these are in some respects more purely holiday seasons than the time which occurs in August when the Bank holiday is fixed. Consequently a loss of holidays at Easter and Whitsuntide means the loss of the best holidays of the year. All that is required to effectuate the change is for Sir John Lubbock to amend his Bank Holiday Act by fixing the two spring holidays for the first or second Monday in April and June, and for the Judges to make rules fixing the legal vacations for the same dates. Politicians would be only too glad to have their holidays at the same time, and thus, though we could not command fine weather and healthy enjoyment, we should have a much better chance of them than can possibly exist when the holidays fall so early as they do this year.

THE RECLAMATION OF LAND.*

THE EMBANKMENTS OF THE THAMES.

THE traveller by the North Kent Railway, as he runs through the rich alluvial marshes which fringe the Thames between Greenwich and Gravesend, sees one of the oldest embankments in England, which stretches on both sides of the river to a length of more than 100 miles, enclosing nearly 30 square miles of what was once a broad estuary, choked with mud banks, ooze, and marshes.

For 400 years the Romans occupied England,—those grand old engineers who boasted they built for eternity,—but of whose massive masonry time has left so few traces, except perhaps in the wild north country, remote from civilisation; but the long earthen banks they raised in the estuary of the Thames still remain to attest the industry and skill of those who reared them.

Gradually as the land accreted, further portions were reclaimed, and whilst the high-water mark of the river was gradually raised, the scour of the tidal water deepened the bed, thus approximating its condition more nearly to that which obtains at present. But these banks were a source of anxiety and danger from the earliest period. In the reign of Edward II. numerous breaches occurred, whilst in the time of Henry VIII. Plumstead and Lesnes Marshes were all drowned by a breach at Erith. So serious was the inundation that the marshes and levels would have been (so it was then considered) irrevocably lost, unless the bailiff had advanced the money to repair the gap; but having done so, he found the collection of the amounts due a matter of such difficulty that complaint was made to Parliament, and it was ordered that the bailiff should cause proclamation to be made on any Sunday afterwards, in the parish church of Plumstede, for the payment of all arrears within twenty days; if not discharged then, there was the option of liquidating the debt by a double sum, until Michaelmas, after which the bailiff could claim the lands for himself and his heirs,—a sure mode of enforcing payment. Again, in the time of Elizabeth, more than 2,000 acres of good pasture ground were laid waste through sundry breaches in the banks, a damage which it took twenty years to repair, so much was the work hindered by floods and tempests. Turning now to the Middlesex and Essex shores, a similar state of things is to be found.

Even in historic times London was almost encircled with marshes. Westminster Abbey stood on Thorney Island, almost surrounded by the water at every tide, which flowed over nearly the whole of St. James's Park. The City itself was partially belted by marshes. Stow describes a great fen stretching from the walls, betwixt Bishopsgate and the postern called Cripplegate, to Finsbury, and to Holy Well, which, when frozen, were covered with multitudes of young people, who go to play on the ice, some "more expert in sporting thereon fix bones under their heels, and taking a pike-staff, do shove themselves forward with so much force that they glide with no less swiftness than a bird flieth, or an arrow passeth from the bow."

Below London continued breaches occurred from the earliest period, but the most serious was that in the Dagenham bank in 1707, which had been once before repaired by Vermuyden, in 1621. Here the tide made a gap more than 100 ft. and 50 ft. deep, which remained open for seven years, in spite of all efforts to stop it, by scuttling ships and sinking cases filled with chalk. At last matters became so serious that about 1,000 acres of marsh were spoiled, and more than 100 acres were swept out into the Thames, forming a bank which seriously impeded the navigation. The Government were then obliged to employ Captain Perry, who succeeded, after much trouble, in stopping the gap, by driving a row of piles across it, strengthened by clay heaped in a mound against it.

The history of the Banks of the Thames has been, from the earliest period, a record of a struggle between man's skill and labour and the winds and waves.

ROMNEY MARSH.

Crossing Kent, we find at the extreme eastern point of Sussex the extensive rich pasture-ground of Romney Marsh, comprising about 24,000 acres, the original embanking of which dates from remote antiquity; and here also as accretions took place, the banks were extended, until the marsh was brought to its present condition. Our public records contain warrants for repeated commissions to repair the sea banks, "rendered ruinous by the rage of the sea"; and the most dreadful storms and inundations are chronicled to have overwhelmed portions of the land during the thirteenth century. Off the southern end of the Marsh lies Old Winchelsea, drowned in the sea on the eve of St. Agatha, 1287, when all the lands were covered from Clivesden to the voucher of Hythe. To resist these inundations the old custom of Romney Marsh was to choose twenty-four chief men or elders, who had power to levy a rate on the marsh lands to maintain the banks, and this ancient local usage laid the foundation for the management of the other enclosures in England.

THE FENLAND.

From the south of England we cross to the eastern counties, where, in the Great Fens of Lincolnshire, extending over more than 1,300 square miles, the largest reclamations in England have taken place. Here, too, we find the Romans' handiwork in the banks which bound the marshes; built to reclaim the silt lying as a fringe around the coast, and which extend for about 150 miles. These ancient engineers proceeded on sound principles, although their works subsequently proved inadequate. They banked the sea fringe of Salt Marshes, and, to carry off the upland waters, cut the Carr Dyke and improved the arterial drainage; but after their departure, in the troublous times which followed, the Fens remained one great dismal swamp, with here and there an island, crowned by one of the numerous abbeys of which the quaint old rhyme runs:—

"Ramsey, the rich in gold and of fee;
Thorney, the flower of many fair tree;
Cowland, the courteous, of their meat and their drink;
Spalding, the gluttons, as all men do think;
Peterborough, the proud;
Sawtrey, by the way,—that old abbay,
Gave more alms in one day than all they."

Through this dreary Fenland wound the rivers Witham, Ouse, and Nene, which often saw the flashing oars of the Danish galleys, and reflected the lurid light of blazing minsters; but a dreadful doom awaited the savage Northmen if captured, as the remains of tanned hide discovered nailed to some ancient church-doors has attested. Time crept on, bringing gradual decay. In the Mediæval times the art of drainage seems to have become almost lost; outfalls of rivers became silted up, and drains and banks neglected: in consequence, from time to time, numerous breaches occurred; but the penalty was short and sharp, the defaulter being placed in the breach, and the bank built over and upon him,—a penalty bearing the impress of the monastic rule, which held sway in the district, and which punishment, it is needless to say, never required to be repeated.

Deeping Fen, however, appears to have been drained by Richard de Rulos in the reign of Henry I., but the bulk of the land continued drowned marsh, until the seventeenth century, dotted here and there with scattered islands, of which Ely was famed for its fertility, as Drayton sings,—

"Of all the marshland isles I, Ely, am the queene,
For each when sad, in me looks fresh and green."

An unwholesome country, which Dugdale describes in the following graphic terms:—"In the winter time the inhabitants, on the hards and upon the banks, can have no help for body or soul; no means to baptise a child or partake of the Communion; no supply of any necessary, saving what those poor desolate places do afford. And what expectation of health can there be to the bodies of men when there is no element good? The air being for the most part cloudy, gross, and full of rotten harrs; the water putrid and muddy, yea full of loathsome vermin; the earth spongy and boggy, and the fire noisome by the stink of smoking hassocks."

An unpleasant picture, but now all is changed, and some of the richest land in England has rewarded the labour and skill of the engineer. To Cornelius Vermuyden belongs the credit of having first carried out a comprehensive scheme for the drainage of the Fens; but, unfortunately, the true principles on which such works should have been constructed were not followed. The plan adopted was to place a sluice on the river

* A paper read by Mr. H. Michell Whitley, A.M. Inst. C.E., on the 15th inst., at an ordinary meeting of the Civil and Mechanical Engineers' Society, Mr. R. Harkness Twig, M. Inst. C.E., president, in the chair.

Ouse at Denver, and thus exclude the sea, whilst the fresh water drained into the Ouse by lateral canals. These works were carried out in spite of the determined opposition of the fenmen, who destroyed the banks and demolished the sluices; Vermuyden triumphed in the end, but his victory brought ruin, and he died poor in obscurity. Conceived as these works were on erroneous principles, the inevitable result followed; the outfalls silted up, and the drainage became more and more defective, and windmills, working scoop wheels to lift the water, began to be generally adopted about the early part of the eighteenth century; but all such expedients only palliated the mischief, and a systematic plan of drainage became an absolute necessity, and this was carried out by Telford and Rennie early in the present century: they adopted the most certain principles of drainage, namely, the improvement of the channels and outfalls of the rivers; catch-water drains to intercept the upland waters; and arterial drains with the best possible fall to drain the lowlands.

In addition, powerful pumping-engines, which have been increased in number from time to time, were set to lift the water from the deeps. The results have been eminently satisfactory, and the Fenland remains a monument of the skill of the engineer. In other counties large tracts of land have been reclaimed, notably in Somersetshire; but these it will not be necessary to allude to, as in many respects they resemble the great enclosures already described; and, having thus briefly considered the history of land reclamation in England, the author will pass on to the general principles which should regulate all inclosures.

THE ACCRETION OF LAND.

In tidal rivers and in sheltered spots of estuaries, the accretion of land is slowly going on; and thus nature, in some measure, compensates for the waste of the coast-line, which in other districts, more especially in the east of England, is year by year taking place, amounting in some places, as along Holderness, to between two and three yards per annum. The cause of these accretions is almost, if not altogether, due to the alluvial deposits brought down by rivers when in flood from their basins. This water, highly charged with silt in suspension, flows downward, until arrested by the tidal flow, when it is deposited mainly in the higher reaches of the estuary; whilst below the banks will be found to be entirely formed of sea-sand.

The proportion of silt brought down by our rivers when in flood has thus a sensible effect on the time in which land becomes ripe for reclamation. The proportion of sediment held in suspension by various rivers has been determined to be approximately as follows:—

Hooghley	1 part in 615	in volume max.
Mississippi	1 ,, 3,000	
Irrawaddy	1 ,, 3,984	in flood."
Danube	1 ,, 1,728	,,
Mersey	1 ,, 1,600	flood tide.
,,	1 ,, 1,400	ebb tide.
Nile	1 ,, 120	maximum.
Humber	1 ,, 180	,,
Waters of the Wash	1 ,, 150 to 1 in 600.	
Allen	1 ,, 1,000	in flood.

The latter proportion was determined by the author in the course of an investigation into the rate of progress of the silting up of the creeks of Falmouth Haven. The numerous branches of this harbour are, in their higher reaches, filled with a tenacious mud, brought down by the rivers and streams discharging into the estuary, which slob now rises on an average to about 4 ft. below high-water mark of ordinary spring tides. The amount of mud carried down into a tidal estuary, even by a small stream, is very considerable. The author calculates from his own observations that from a watershed of 29 square miles draining into Tresilian Creek, 370,000 cubic feet of mud are annually removed, and that the creek itself is thus silting up at the rate of about 1 ft. in 100 years.

By a comparison of charts taken in 1814 and 1858, and cross sections of the adjoining Truro Creek, it is found that an average depth of 1 ft. 9 in. of mud has accumulated in this branch of the river between the dates above mentioned; and as the tidal scour lessens by the gradually diminished water area, an increasing rate of deposit obtains.

On the Lincolnshire coast, Mr. Gordon states, that by a survey made by William Hayward in 1604, the old Roman bank was then the sea-bank between Lynn and Wisbeach, and Wisbeach and Spalding; there was then a mile of salt marsh accreted in advance of the sea-bank, between Lynn and Wisbeach, and nearly two miles between Newton and the Welland.

In 1723 these marshes were taken in; and in 1795 the banks were two miles in advance of the old Roman bank, and four miles in advance of Holland. The cause of the rapid accretion in the past two centuries has been the embanking of the salt marshes, which will only extend to a little over half a mile beyond the bank at the utmost, when they break off suddenly by a scarp about 1 ft. in height. In the formation of these salt marshes, the silt is gradually deposited on the surface of the base sand, adjoining the recently-formed bank, and, as it grows and becomes covered, first with samphire and then with coarse sea grass, the process of accretion is assisted by the warp being entangled in the vegetation.

The first indications of vegetation and samphire appear about the level of high-water neap tides. Above this level the sea grasses appear, which will grow to about 2 ft. under the level of the high-water spring tides, and the ordinary salt marsh will be from high-water spring tides to 2 ft. above it.

The marshes on the Seine require about twelve years to rise to the level of high-water; and Mr. Wheeler states that in the Fen district silt foreshores outside a new bank become grass marsh in about ten years, but that it is not ripe for reclamation until a further period of from twenty to twenty-five years has elapsed.

WARPING.

In order to hasten the accretion of land resort has sometimes been had to artificial means; this result may be attained by one of two methods; by embanking the land, and then allowing the tidal water, charged with mud in suspension to flow over the land and deposit its silt; its place being taken from time to time by a fresh supply admitted through the sluice. In favourable positions the accretion by this method is very rapid, and the consequent increase of value of the land great.

Whilst the second plan, much in favour on the Fen coast, is to entangle the warp in rows of faggots placed parallel to the bank, and thus assist its disposition.

TIME FOR RECLAMATION.

The time at which it becomes expedient to reclaim outlying marsh lands depends much on local considerations; but as a general rule it it may be assumed that it will not pay to inclose slob, which lies very much below the level of the salt marshes, although in some estuaries, as the Tay, some marshes 3 ft. to 4 ft. below high-water have been taken in, whilst other inclosures have been made at a much lower level. On the Thames the marshes lie about 7 ft. below high-water. Romney marsh is 10 ft., and some of the land in the Fens 11 ft. to 14 ft. below the same level. Broadsands, reclaimed by the Heanton embankment in the estuary of the Taw, is 6 ft. to 10 ft. below high-water. The character of the land, the rise of the tides, and the facilities for drainage, must be carefully considered in each individual case before determining the exact area of land it will be advisable to reclaim. If the land lies low, it will generally be found very advisable, if practicable, to warp the land to a higher level, by the admission of the tidal water, which rapidly deposits the sediment with which it is laden; the higher the lands are warped the more valuable they become, and the more easy they are drained. The process of soiling is, as a rule, a very expensive one.

In fixing the line of the embankment another matter to be considered will be the amount of tidal water that may be abstracted from the estuary without injuring the navigation. Reclamation and the improvement of the tidal compartment of rivers are conflicting interests, and the former works require to be carried out with the utmost care.

In some harbours and estuaries, where a narrow entrance leads to a large sheet of tidal water, the flow in and out has scoured a deep passage, out of all proportion to the depth it is desirable to retain, and here land may be beneficially reclaimed; but in other cases the abstraction of tidal water from one portion of the estuary should be compensated for by judicious works, whose effect will be to fix the navigable channel to one definite course, and to furnish a reservoir for tidal water to maintain the scour.

The amount of land that should be reclaimed at one time should not, as a rule, exceed 1,000 acres, and with this amount, with any considerable rise of the tide, the shut out will become a matter of some difficulty. When banks are closed in one tide, it would be advisable to limit the quantity to be inclosed to about 300 acres.

INCLOSURE BANK.

The first point to be settled in designing the bank will be its height above high-water ordinary spring tides. This will have to be fixed by determining the highest flood level, and adding to it the height of the waves which may be expected.

The action of a strong gale in heaping up the water on a lee shore is well known, and Sir Charles Hartley states that the tide in the Black Sea, at the mouth of the river Danube, is raised 2 ft. above its main level by strong south-east winds, and the extraordinary high tide in the Thames of November 15th, 1875, which rose to 4 ft. 9 in. above Trinity high-water, occurred the day after a heavy gale from the west, which raised the water in the channel to a great height, and at Harwich the highest flood level in the estuary of the Stour during the past five years has been 4 ft. 4 in. above high-water ordinary spring tides. When on the occurrence of high tides a land flood takes place, the maximum flood level will be attained.

The amount of rise due to the land flood in the high tide in the Thames, previously mentioned, is calculated by Mr. Redman to have been only about 3 in. to 3½ in., but above the tidal range in rivers the floods rise much more; thus, the Severn at Worcester has been known to rise more than 20 ft. during a heavy flood. As a general rule, if from 5 ft. to 6 ft. is taken as flood-level above high water ordinary springs it will be found to allow a sufficient margin. The height of waves, to which the bank will be exposed, depends mainly on the length of fetch, and for distances under ten miles, from 3 ft. to 4 ft. would be an ample allowance. Thus, from 8 ft. to 10 ft. may be taken as being the average height to which it will be advisable to raise the bank above high-water mark; but in exposed situations this should be still further increased. The profile of the bank has next to be considered, whether a steep slope, heavily pitched, shall be adopted, or a flatter slope with a slighter defence. A diagram exhibited to the meeting illustrated a type of the first class of embankment, being a section of the bank along the face of the marsh in the Leven estuary in Morecambe Bay. Mr. Brunlees found by experiment that the slope which gave the greatest adhesion to the pitching was 2 to 1. This inclination was therefore adopted for the sea slope, which was faced with 12 in. of clay puddle and 18 in. of small rubble stones, on which the pitching, 18 in. thick at the bottom of the slope and 12 in. thick at the top, was laid. The bank varied from 15 ft. to 25 ft. high, and was of sufficient width to take two lines of rail, whilst the land slope was 1½ to 1. A cross-section of Dymchurch sea-wall in the Romney Marshes, as re-modelled in 1837, was also shown. This bank is 20 ft. wide, the top being 10 ft. above ordinary spring tides. The sea face has a very flat slope of 7 to 1, with a steep curved finish to a radius of 7 ft. 6 in., this portion of the bank being pitched. There is no doubt that this form tends to check the run of the waves over the bank; but, on the other hand, there is a tendency in such a concave bank to throw the wave back on the pitching, and thus cause breaches in it. The third diagram showed a cross-section of the Zuyder Zee Bank, lately constructed by Sir John Hawkshaw. This bank is founded on a layer of fascines; the top width is 13 ft. 1½ in., which is 10 ft. above ordinary high water; the land slope is 2 to 1, and the sea slope 3½ to 1; the slopes are coated to a depth of 3 ft. 3 in. with clay, and the sea-side is further protected by 12 in. of basalt paving, laid on broken bricks.

The ordinary dykes in Holland are raised from 10 ft. to 13 ft. above high water, the large banks are 10 ft. to 20 ft. wide at the top: and the small from 8 ft. to 10 ft. The sea slope is, at the top, usually 3 to 1; below that, 8 or 10 to 1 or even flatter; and when the site is much exposed, an inclination of 6 to 1 is adopted for the upper part of the sea slope; the land slope is generally 1½ to 1.

The cross section of the bank enclosing Sunk Island on the Humber, was next shown. Here the top is 4 ft. wide, with a slope to the sea of 5 to 1, and one to the land of 1½ to 1.

The St. Mary sea-wall on the Medway, on the site of the New Chatham Docks, was next illustrated. The top is 7 ft. above Trinity high-water mark, the back slope is 1¾ to 1, and the

sea slope is 5 to 1, faced with 10 in. of pitching, laid on 6 in. of concrete, whilst the toe of the wall is protected by loose rubble and piling.

A cross section of the Heanton Bank was next referred to. This bank rises 7 ft. above high-water spring tides, is 4 ft. wide at the top, with a land slope of 2 to 1; the sea face is formed to a slope of 3 to 1 to high-water mark, and beyond to inclinations of 4 to 1, and 5 to 1, faced with 2-ft. of puddle, and protected by 12-in. pitching.

Such are a few of the forms that have been adopted for reclamation banks, the material of which they are composed being governed by the situation of the works.

Clay is the best material for a bank, and it may often be obtained seaward of the works, but in many cases sand only is available. If the latter is used some precautions have to be taken. The pitching should be carried to flood-level, and the bank above sodded 6 in. deep; with clay the inner slope may be sown with safety, but not with sand, as the effect of surf, breaking over the bank in a heavy gale, is to scoop out hollows, which rapidly enlarge, until they cause a breach through the bank; but if the slope is protected by careful sodding, this form of mischief is prevented in a great degree. Banks on firm sand are easy to construct: the Broadsands Embankment, of the Heanton Marsh Reclamation, was carried over a quick-sand where no solid ground could be touched with 20 ft. boring-rod, whilst banks carried over slob-lands require much more material from the displacement of surface, by the weight brought upon it.

THE SHUT OUT.

The closing of the embankment is the most difficult portion of the construction of works for the reclamation of land. There are two methods which may be followed, either to narrow up the gap until scour begins to be seriously felt, and then close the opening in a single tide, or to bring the bank up to the "shut-out," and close it horizontally by gradually shallowing it from the bottom, guarding each layer with fascines weighted with clay and stones, and so filling the breach. The former plan is specially suited to small reclamations, whilst the latter is best adapted when a large area is reclaimed.

SLUICES.

The main sluice for the drainage of the reclaimed marsh should be laid out so as give the greatest possible fall consistent with a free discharge. If the sill is fixed at about mid-tide level the sluice will run about five or six hours every tide, which will ensure a sufficient natural drainage. Low-water neap tides is the lowest level that should be in any case adopted. The main drainage cut within the sluice should be of sufficient dimensions to store the drainage-water during the time the sluice-gates are closed by the tide. The doors themselves may either be hinged vertically or horizontally. In the former case they are fixed in front of the culvert, and form a letter V against the tide, opening by the weight of water behind them. In the latter, the door is hinged on the sea-face either in one leaf or several flaps one over another. In either case it is essential that groves should be provided in the masonry of the culvert to close it in case any breakdown occurs in the doors themselves. In fixing the level of the sill of the culvert, it must be borne in mind that reclaimed land, especially that of a loose nature, will subside by the gradual drainage of the water, and therefore allowance must be made. Whittlesea Mere, which was drained in 1850, may be mentioned as a very extreme case. Here the surface subsided 8 ft. 2 in. in the first fifteen years. The reclamation of land is essentially a commercial question, and the element of cost is thus an all-important one.

The following table gives particulars of a few reclamation works, showing the amount of land reclaimed and the expense incurred by the works and internal improvement:—

Name of Reclamation.	Cost per Acre.		Total per Acre.	Value of Land per Acre.
	Inclosure.	Internal Improvements.		
	£	£	£	£
Lough Foyle	20	10	30	45
Heanton	35	10	45	75
Fenland Marshes (average)	15 to 20	3 to 4	18 to 24	50 to 60
Friedrichen Koog, Schleswig	...	...	24	70
Maxquelles Koog, Schleswig	...	...	18	35
Lake Y, Holland	...	...	26	70
Leymeer, Holland	31	2	33	50

HEANTON MARSHES RECLAMATION.

As a practical illustration of the principles laid down in this paper, the author will briefly describe the reclamation works executed by his father, Mr. Whitley, of Truro, for the purpose of embanking the marshes which fringed the manor of Heanton Punchardon, on the estuary of the Taw. Here within the blown sand-hills which bound the bay, formerly lay a very extensive tract of salt marshes. Six hundred acres of these were embanked many years ago, and now form some of the richest land in the West of England; but this reclamation left scattered fringes of marsh land, and it was to enclose these that the works were undertaken. From the nature of the ground, a considerable length of embankment was required, amounting to about six miles, to reclaim 400 acres of marsh land. The section of the bank itself has been already described, and its form founded on the natural seaward slope of the "Pebble Ridge," has been found to be well adapted to resist the heavy seas to which it is at times exposed; indeed, during one exceedingly heavy flood, in which the majority of the banks in the estuary gave way, it sustained but very little damage. The paving was of Devonian slate, from the Braunton Down Quarry, laid up and down the slope, beaten into the clay puddle, with which the seaward face was coated. A small portion of the pitching, done with round boulders, was found not to be able to resist the beat of the sea.

The culverts were built in masonry, of local stone, in blue lias lime, the sills being laid at 16 ft. below high-water mark ordinary spring tides, and were closed with the usual valves. The shut out was effected by narrowing the opening, until scour began to be seriously felt; the ends of the banks and the floor of the gap, which was 200 ft. across, were protected with furze, weighted with stones, and by the aid of 140 one-horse carts, the shut out was completed in a single tide; the area of this portion reclaimed being 200 acres. The cost of the embankments was 13,394*l.*, and to this must be added the expense of the internal improvements, about 10*l.* per acre, giving a total of 18,000*l.*, or 45*l.* per acre. The value of the land reclaimed may be taken at about 75*l.* per acre, thus giving a fair profit on the reclamation.

Having thus considered the general question of the reclamation of land, the author, in conclusion, would point out the great importance of this subject, considering the vastly increasing population of the British Isles.

The waste of land around our coast is continually progressing, but nature compensates in some measure for this loss by adding, year by year, to the rich salt marshes which fringe our estuaries, and which only require capital, guided by the skill of the engineer, to convert them into luxuriant grazing lands, and thus to add to the food supply of the empire.

The cost and uncertainty of obtaining an Act of Parliament, by which alone enclosures can be carried out (except by the frontager to whom all land, as it accretes and rises above high-water mark belongs), necessarily deters capitalists from embarking in these useful undertakings, but the national gain that results from well-judged reclamation induces the author to draw attention to this subject. He would suggest that a Royal Commission should be empowered to ascertain what lands are ripe for reclamation around our coasts and in our estuaries, especially considering, in the latter case, what area may be embanked without injuriously affecting the tidal scour, and fixing in each case the lines on which banks might be constructed. If a general reclamation Act were then passed, authorising the enclosure of such lands within the lines laid down, a simple certificate from the Board of Trade might be substituted for the present course of procedure. An application for such a certificate should, of course, be accompanied by a sufficient guarantee that the works would be carried out, and should be only granted if the frontagers were not themselves prepared to enclose the lands.

The advantages that would attend such a course are numerous: not only the owner of the frontage would benefit by the compensation and additional security afforded to his low-lying lands, but capital would find a fresh field for investment; and, lastly, the nation itself would be the richer, as it has been estimated that about 500,000 acres of land may be added to our grazing marshes by judicious, well-considered reclamations.

These reasons have induced the author to bring the subject before the public, in the hope that he may succeed in drawing attention to what is, from a public point of view, worthy of serious consideration.

HOUSES IN COREA.

A DESPATCH from Her Majesty's Minister in Japan, forwarding a report on Corea, has been published, and contains some items of interest. We note, for instance, that the town of Wönsan is considered by the Coreans one of the great commercial centres of their country. It extends for more than a mile along the southern shore of the bay, and consists of about 2,000 houses with a population of, perhaps, 10,000 inhabitants. One main street of some 10 ft. or 12 ft. in width winds through it from end to end, and into open numerous narrow and crooked alleys. Near each end of the town there is an open space where a market, chiefly for agricultural produce, is held periodically. The houses strongly resemble those seen at In-chhön on the western coast. They consist of a kitchen with an earthen floor, and two or three other rooms, seldom more than 8 ft. or 9 ft. square, with ceilings about 6 ft. or 7 ft. in height. The kitchen has one or two large clay fire-places, the smoke from which passes in flues underneath the rest of the houses, warming them comfortably, and finding a vent at the other side in a chimney of stone cemented with clay and surmounted with a hollow log, or by several earthen pots lashed together by straw ropes. Many of these chimneys project into the street, giving it a very odd appearance. The doors do not slide like the Japanese doors, but are on hinges, and are not more than 4 ft. or 5 ft. in height. The windows are wooden lattices covered with paper, and no glass is to be seen. All the houses are of one story only, with thatched roofs, the eaves being only 6 ft. or 7 ft. from the ground. The framework is of wood, the interstices being filled with woven reeds plastered with clay. The floors are matted, and carpets of thick oil-paper are sometimes seen. There is no furniture. There are not many shops, and those there are have a very poor appearance, the whole stock in-trade amounting in value to a very few dollars. In only two or three were there any European goods exposed for sale. Road-making at Wönsau consists in filling up the hollows with soft earth, and there seem to be no arrangements whatever for cleaning the streets. There are numerous pig-styes in front of the houses in the main street, and the passenger is constantly in danger of stumbling over their occupants. The settlement contains about forty houses, including the consulate, a Buddhist mission-house, and twelve or thirteen merchants' offices, the rest being shops or restaurants. There are numerous vacant lots, less than half the available space having been built upon.

A Memorial Pulpit.—A new pulpit has just been erected in the parish church of Knill, near Kington, Herefordshire, on the borders of Radnorshire. The memorial was designed by Mr. S. W. Williams, architect and county surveyor, Rhayader, and is in keeping with the rest of the church, which was restored by the same architect ten years ago. Of Early English character, the pulpit has a base of wrought stone work, circular on plan at the bottom, and breaking into an octagon higher up. There is an approach of four steps to gain the body of the pulpit itself. All this portion is of oak, put together with oaken pins, and butt-jointed. The panels are recessed in each cant, traceried in their heads, and filled with carving. The whole is surmounted by a carved cornice. The pulpit is the work of Mr. Harry Hems, of Exeter.

THE HISTORICAL DEVELOPMENT OF ORNAMENTAL ART.

IN the third and concluding lecture of this course, delivered under the auspices of the Painters' Company, in their hall, in Little Trinity-lane, the lecturer, Dr. Zerffi, began by saying that there were three things that every one believes himself able to teach without having learned any thing of either: theology, medicine, and art. They cannot understand that in art as in science one evolution naturally succeeds another; that the previous evolution must be the basis of what you are to produce; not merely copying the old forms, but using them with new spirit for new purposes,—as art progressing, not retrogressing. Your Gothic is a skeleton, your tracery only a vain meaningless something,—a copy and nothing more. The sentiment and feeling that produced it are gone. Could the Renaissance have been possible without the Reformation? Was the Reformation possible without the inventions that preceded and accompanied it? What did these owe to the inventions of paper and printing? What had hitherto been retained in a small circle was spread broadcast by these wonderful inventions. The Renaissance connects Greek and Gothic art. The Greek is plastic; the Gothic pictorial. The Greek a petrified organism; the Gothic a plant-like organic growth. You can add to the Law Courts as much as you like, but you cannot add to the Parthenon. Greek art keeps on earth; Gothic rises up to heaven,—strives after the infinite. The horizontal line is Greek. You cannot make your Greek temple higher than the just proportion to the counteracting horizontal line. In the Gothic you cannot go too high. Cologne Cathedral is an immense height, but were it much higher it would only the more impress and lift you up. The Greek art was one of passion, yet of harmony and repose. The Gothic art was an allegory of mythical and spiritualised life. Study the lives of the saints, fill your mind with the things which concerned them, and you will produce a totally different creation in art to that produced by one whose mind is imbued fully with Homer and the Iliad. The change that produced the Renaissance is the amalgamation of these two different ways of thinking. The Renaissance is the medium between the horizontal line of the Greek and the vertical line of the Gothic,—spreading and striving upwards. There are different styles of Renaissance,—the ornamentation is different,—but, remember, if you begin with Ionic continue with Ionic; do not mix it up with Corinthian and Doric, as we see some rooms decorated, where Japanese, Indian, Gothic, and Chinese are all muddled up together. There is a real law in art which must be obeyed. We are greatly addicted to believing anything that appears in print. "We read it in print, therefore it must be right," is a too common expression, when so much that is false and meretricious is constantly being printed. We have it in print from one writer that the Renaissance is a plague and a blight; and the same author goes on to admire a statue of Buddha, 53 ft. high, with a nimbus 83 ft. in diameter. Out of all proportion! Absurd! Some people will not understand how difficult it is to learn properly, how long we must study and yet only become a student and not an authority in art. For some, the eleventh and twelfth century work is highest art. In reality all is overdecorated and coarse. With such the Renaissance is meretricious and wants taste. When have ever the Goths produced gates like those of St. Mark's, Venice? But it is so much easier to copy those eleventh and twelfth century saints, with large heads, red hair, and blue eyes, dressed as with so many ropes hanging round the figure, and to cover this dress with diapers in blue, green, and violet. They admire and seek to imitate these coloured statues. Let marble never be painted. Let it speak for itself. If you make the form of a woman, with the spirit of a woman, the form will tell all there is to tell. Your painted hair and painted eyes,—that is *the* meretricious. It is not necessary that a reformer should be a theologian. Can we justly estimate the immense influence of Shakspeare in poetry, or Michelangelo in art? They do not belong to a nation: they belong to humanity at large. Dante's Divine Comedy with its imaginings of Heaven and Hell; his *Virgil* expiating his Heathen notions in Purgatory, and finally entering Heaven, thus reconciling the heathen and the Christian. All these influences worked to produce these Renaissance ornaments, like so many songs in stone and metal. In the days of Inigo Jones men really spent money, and spent it tastefully. Our corporations spend more in what they eat than what they spend in art. They ought to send you out to the countries where the finest art-collections of the world are preserved. We can do it. We have something scarce among other nations: we have a perseverance and a certain measure of accuracy which will be valuable to us when our art-education is more thorough. The great masters of former days had whole schools to help them; now you make it a reproach to an artist if he does not do all himself. We must be content to recognise that some can be composers in art, and others the performers. Raffaelle, Correggio, Titian, and Rubens, all had many helpers whom they directed and taught. They told all they knew. Your modern painter will tell nothing. His peculiar mixture of red and green for fine effects are his trade secret. The various epochs of the Renaissance,—the *Tre-cento*, with its exquisite foliage and delicate arabesque; the *Quadro-cento*, more stiff, with animals and cartouches introduced; the *Cinque-cento*, the finest and most finished Leonardo da Vinci (by whom whatever we know of colour is already laid down as a law), and Michelangelo. Do not attempt to copy Michelangelo unless you have his genius. You do not attempt to copy Shakspeare. Modern art imitations of Michelangelo cause indescribable confusion. We take photographs of his works on ceilings that are 120 ft. high, and hang the photographs here on the wall. Then we say of those heavy shadows and rope-like sinews, that is Michelangelo's style. Yes, his style 120 ft. from the eye, but not here on the wall beside you. We must never forget that art has its principles, which, if neglected, what you produce can never be artistic. What you copy from nature must be conventionally treated. Compare these two capitals; that miserable concoction of reality, with this, conventionally twisted up so beautifully for the purpose of the artist: we make the mistake of wanting to cover the whole space. You must leave plain space to give repose to your ornament. Get some examples of the works of Dürer and Holbein. Try to decorate with the forms they used,—not copying. Try to use the single line twisted artistically like the damascened work of the Moors, to decorate a panel or border. None of the great painters named refused to be a decorator. Ask an R.A. to decorate your house. He is insulted. He cannot do it. He does not know how. You must know a great deal to be a decorator. You must know metals, stones, and marbles. You must know botany, not the Latin names, but the forms and colours, their symbolic meaning. You must know the animal kingdom; anatomy; the different passions and how to represent them; you must understand grouping, keeping the mean and coarse at the bottom, the fine and delicate at the top. It is a disgrace to us that our best books are illustrated by foreigners, our historical pictures painted by foreigners. Our party spirit will not allow us to accept a universal art. You are Whig, and will not have that picture because the painter has introduced Charles I. into it; or you are a Tory, and you will not have that picture with Cromwell in it. So your artist paints something that will not offend. A fine lady giving a piece of sugar to a canary bird, or a brown woman, and calls it by a foreign name. There is no Whig or Tory in art. You must know ethics and æsthetics. You cannot separate these two. The man who thinks beautiful will act beautiful. Your genuine artist will be a fine character. I defy you to find in all history a real genuine artist in the criminal dock. It is against all the harmony that a genuine artist brings into his work. Harmony of colour and design is only produced by harmony of thought and action. In conclusion, do not go home and think you have learned all about art. All I have said is to show you there is something to be studied and to indicate what you want to study. After a lifetime devoted to art you may find that you are still only a student.

After a cordial vote of thanks to the lecturor, Mr. W. F. London, replying to a similar vote to the Master and Court of the Painters' Company, said he was very pleased to see the numerous and attentive audience which had attended each of the lectures. He might claim for the Painters' Company that they had inaugurated technical education. So far back as 1867 they had established exhibitions and given prizes for works of merit in the various branches of house decoration. Their limited means had prevented the continuance of these exhibitions. They had applied in vain to the more wealthy City companies for help. They had, therefore, to be content with giving special prizes and medals to some of the art schools. This year, at the suggestion of Past-master Mr. J. G. Crace, they had arranged for these lectures to be given, and he hoped all would be able to carry away something which would be of life-long benefit to them. A. B.

ELECTRICAL TRANSMISSION AND STORAGE OF POWER.

THE INSTITUTION OF CIVIL ENGINEERS.

IN the third of the series of six lectures on the Applications of Electricity, delivered by Dr. C. William Siemens, F.R.S., the lecturer said,—Thus far electricity had been introduced as the swift and subtle agency by which signals were produced either by mechanical means or by the human voice, and flashed almost instantaneously to distances which were limited, with regard to the former, by restrictions imposed by the globe. To him had been assigned the task of introducing to their notice electric energy in a different aspect. Although still giving evidence of swiftness and precision, the effects he should dwell upon were no longer such as could be perceived only through the most delicate instruments human ingenuity could contrive, but were capable of rivalling the steam-engine, compressed air, and the hydraulic accumulator in the accomplishment of actual work.

In the early attempts at magneto-electric machines, it was shown that, so long as their effect depended upon the oxidation of zinc in a battery, no commercially useful results could have been anticipated. The thermo-battery, the discovery of Seebeck in 1882, was alluded to as a means of converting heat into electric energy in the most direct manner; but this conversion could not be an entire one, because the second law of thermo-dynamics, which prevented the realisation as mechanical force of more than one-seventh part of the heat energy produced in combustion under the boiler, applied equally to the thermo-electric battery, in which the heat, conducted from the hot points of juncture to the cold, constituted a formidable loss. The electro-motive force of each thermo-electric element did not exceed 0·036 of a Volt, and 1,800 elements were therefore necessary to work an incandescense-lamp.

Faraday's great discovery of magneto-induction was noticed, and the original instrument by which he had elicited the first electric spark before the members of the Royal Institution in 1831 was shown in operation. It was proved that although the individual current produced by magneto-induction was exceedingly small and momentary in action, it was capable of unlimited multiplication by mechanical arrangements of a simple kind, and that by such multiplication the powerful effects of the dynamo-machine of the present day were built up. One of the means for accomplishing such multiplication was the Siemens armature of 1856. Another step of importance was that involved in the Pacinotti ring, known in its practical application as the machine of Gramme. A third step, that of the self-exciting principle, was first communicated by Dr. Werner Siemens to the Berlin Academy on the 17th of January, 1867, and by the lecturer to the Royal Society on the 4th of the following month. This was read on the 14th of February, when the late Sir Charles Wheatstone also brought forward a paper embodying the same principle. The lecturer's machine, which was then exhibited, and which might be looked upon as the first of its kind, was shown in operation; it had done useful work for many years as a means of exciting steel magnets. A suggestion, contained in Sir Charles Wheatstone's paper, that "a very remarkable increase of all the effects, accompanied by a diminution in the resistance of the machine is observed when a cross wire is placed so as to divert a great portion of the current from the electro-magnet," had led the lecturer to an investigation read before the Royal Society on the 4th of March, 1880, in which it was shown that by augmenting the resistance upon the electro-magnets one hundred fold, valuable effects would be realised, as illustrated graphically by means of a diagram.

The most important of these results consisted in this, that the electro-motive force produced in a "shunt-wound machine," as it was called, increased with the external resistance, whereby the great fluctuations formerly inseparable from electric arc-lighting could be obviated, and that, by the double means of exciting the electro-magnets, still greater uniformity of current was attainable.

The possibility of transmitting power electrically was so obvious that suggestions to that effect had been frequently made since the days of Volta, by Ritchie, Jacobi, Henry, Page, Hjorth, and others; but it was only in recent years that such transmission had been rendered practically feasible.

Just six years ago, when delivering his presidential address to the Iron and Steel Institute, the lecturer had ventured to suggest that "time will probably reveal to us effectual means of carrying power to great distances, but I cannot refrain from alluding to one which is, in my opinion, worthy of consideration, namely, the electrical conductor. Suppose water-power to be employed to give motion to a dynamo-electrical machine, a very powerful electrical current will be the result, which may be carried to a great distance, through a large metallic conductor, and then be made to impart motion to electro-magnetic engines, to ignite the carbon points of electric lamps, or to effect the separation of metals from their combinations. A copper rod 3 in. in diameter would be capable of transmitting 1,000 horse-hower a distance of say thirty miles, an amount sufficient to supply one quarter of a million candle-power, which would suffice to illuminate a moderately-sized town." This suggestion had been much criticised at the time, when it was still thought that electricity was incapable of being massed so as to deal with many horse-power of effect, and the size of conductor he had proposed was also considered wholly inadequate. It would be interesting to test this very calculation by recent experience. Mr. Marcel Deprez had, it was well known, lately succeeded in transmitting as much as 3-h.p. to a distance of 40 kilomètres (25 miles) through a pair of ordinary telegraph wires of 4mm. diameter. The results so obtained had been carefully noted by M. Tresca, and had been communicated a fortnight ago to the French Academy of Sciences. Taking the relative conductivity of iron wire employed by Deprez, and the 3-in. rod proposed by the lecturer, the amount of power that could be transmitted through the latter would be about 4,000 h.p. But Deprez had employed a motor-dynamo of 2,000 Volts, and was contented with a yield of 32 per cent. only of the power imparted to the primary machine, whereas he had calculated at the time upon an electro-motive force of 500 Volts, and upon a return of at least 40 per cent. of the energy imparted. He had been anxious, indeed, not to overstate the case, and if he were now asked what size of conductor he would recommend, he would say a 3-in. copper rod. In March, 1878, when delivering one of the Science Lectures at Glasgow, he said that a 2-in. rod could be made to accomplish the object proposed, because he had by that time conceived the possibility of employing a current of at least 1,000 Volts. Sir William Thomson had at once accepted these views, and with the conceptive ingenuity peculiar to himself, had gone far beyond him, in showing before the Parliamentary Electric Light Committee of 1879, that through a copper wire of only ½-in. diameter, 21,000 h.p. might be conveyed to a distance of 300 miles with a current of an intensity of 80,000 Volts. The time might come when such a current could be dealt with, having a striking distance of about 1·2 ft. in the air, but then, probably, a very practical law enunciated by Sir William Thomson would be infringed. This was to the effect that electricity was conveyed at the cheapest rate through a conductor, the cost of which was such that the annual interest upon the money expended equalled the annual expenditure for lost effect in the conductor in producing the power to be conveyed. It appeared that Mr. Deprez had not followed this law in making his recent installations.

Sir William Armstrong was probably first to take practical advantage of these suggestions in lighting his house at Cragside during night-time, and working his lathe and saw-bench during the day, by power transmitted through a wire from a waterfall nearly a mile distant from his mansion. The lecturer had also accomplished the several objects of pumping water, cutting wood, hay, and swedes, of lighting his house, and of carrying on experiments in electro-horticulture from a common centre of steam-power. The results had been most satisfactory; the whole of the management had been in the hands of a gardener and of labourers, who were without previous knowledge of electricity, and the only repairs that had been found necessary were one renewal of the commutators and an occasional change of metallic contact brushes.

An interesting application of electric transmission to cranes, by Dr. Hopkinson, was shown in operation.

Amongst the numerous other applications of the electrical transmission of power, that to electrical railways, first exhibited by Dr. Werner Siemens, at the Berlin Exhibition of 1879, had created more than ordinary public attention. In it the current produced by a dynamo-machine, fixed at a convenient station and driven by a steam-engine or other motor, was conveyed to a dynamo placed upon the moving car, through a central rail supported upon insulating-blocks of wood, the two working-rails serving to convey the return current. The line was 900 yards long, of 2-ft. gauge, and the moving car served its purpose of carrying twenty visitors through the Exhibition each trip. The success of this experiment soon led to the laying of the Lichterfelde line, in which both rails were placed upon insulating sleepers, so that the one served for the conveyance of the current from the power station to the moving car, and the other for completing the return circuit. This line had a gauge of 3 ft. 3 in., was 2,500 yards in length, and was worked by two dynamo-machines, developing an aggregate current of 9,000 Watts, equal to 12 h.p. It had now been in constant operation since the 16th of May, 1881, and had never failed in accomplishing its daily traffic. A line one-half a kilomètre in length, but of 4 ft. 8½-in. gauge, was established by the lecturer at Paris in connexion with the Electric Exhibition of 1881. In this case, two suspended conductors in the form of hollow tubes with a longitudinal slit were adopted, the contact being made by metallic bolts drawn through these slit tubes, and connected with the dynamo-machine on the moving car by copper ropes passing through the roof. On this line 95,000 passengers were conveyed within the short period of seven weeks.

An electric tramway, six miles in length, had just been completed, connecting Portrush with Bush Mills, in the north of Ireland, in the installation of which the lecturer was aided by Mr. Traill, as engineer of the company, by Mr. Alexander Siemens, and by Dr. E. Hopkinson, representing his firm. In this instance the two rails, 3 ft. apart, were not insulated from the ground, but were joined electrically by means of copper staples and formed the return circuit, the current being conveyed to the car through a ⊤ iron placed upon short standards, and insulated by means of insulite caps. For the present the power was produced by a steam-engine at Portrush, giving motion to a shunt-wound dynamo of 15,000 Watts = 20 h.p., but arrangements were im progress to utilise a waterfall of ample power near Bush Mills, by means of three turbines of 80 h.p. each, now in course of erection. The working-speed of this line was restricted by the Board of Trade to ten miles an hour, which was readily obtained, although the gradients of the line were decidedly unfavourable, including an incline of two miles in length at a gradient of 1 in 38. It was intended to extend the line six miles beyond Bush Mills, in order to join it at Dervock station with the North of Ireland narrow-gauge railway system.

The electric system of propulsion was, in the lecturer's opinion, sufficiently advanced to assure practical success under suitable circumstances, —such as for suburban tramways, elevated lines, and above all lines through tunnels, such as the Metropolitan and District Railways. The advantages were that the weight of the engine, so destructive of power and of the plant itself in starting and stopping, would be saved, and that perfect immunity from products of combustion would be insured. The limited experience at Lichterfelde, at Paris, and with another electric line of 765 yards in length, and 2 ft. 2 in. gauge, worked in connexion with the Zaukerode Colliery since October, 1882, were extremely favourable to this mode of propulsion. The lecturer, however, did not advocate its prospective application in competition with the locomotive engine for main lines of railway. For tramways within populous districts, the insulated conductor involved a serious difficulty. It would be more advantageous under these circumstances to resort to secondary batteries, forming a store of electrical energy carried under the seats of the car itself, and working a dynamo-machine connected with the moving wheels by means of belts and chains.

The secondary battery was the only available means of propelling vessels by electrical power, and considering that these batteries might be made to serve the purpose of keel ballast, their weight, which was still considerable, would not be objectionable. The secondary battery was not an entirely new conception. The hydrogen gas battery suggested by Sir Wm. Grove in 1841, and which was shown in operation, realised in the most perfect manner the conception of storage, only that the power obtained from it was exceedingly slight. The lecturer, in working upon Sir William Grove's conception, had twenty-five years ago constructed a battery of considerable power in substituting porous carbon for platinum, impregnating the same with a precipitate of lead peroxidised by a charging current. At that time little practical importance attached however to the subject, and even when Planté, in 1860, produced his secondary battery, composed of lead plates peroxidised by a charging current, little more than scientific curiosity was excited. It was only since the dynamo-machine had become an accomplished fact, that the importance of this mode of storing energy had become of practical importance, and great credit was due to Faure, to Sellon, and to Volckmar, for putting this valuable addition to practical science into available forms.

COMPARISON OF DWELLING-HOUSES IN THE VARIOUS EUROPEAN CAPITALS.

At a recent meeting of the Hamburg Architectural Society, Herr Asmus gave an interesting comparative description of the sorts of dwellings adopted in the various capitals of Europe. In Paris, he remarked, houses for letting off are the rule, with such commodious arrangements of the various *suites* of rooms as may allow the owner to cover the usually heavy cost of the site. The general disposition of the rooms is almost stereotyped, and is influenced by the fact that the French value domestic life far less than the English or the Germans. The dwelling is reached by a door from the corridor, and contains an ante-room, which in smaller households serves as a dining-room. The other rooms are in more or less direct connexion with this ante-room. The apartments of the servants are usually all in the top story, and in addition to the stone steps, wooden staircases for the servants are usually constructed between each story. The rooms are generally small and richly fitted up. The façades of the houses are usually much ornamented with work in limestone. There being no official regulations as to the thickness of walls, they are comparatively thin. Main-walls are in the lower portions about 1 ft. 6 in. and side-walls 10 in. thick.

In Vienna the development of modern house-building has, it would seem, been much facilitated by the constructive skill of several local architects. During the last twenty years large houses have been built, the grouping of which has been designed to produce striking architectural effects. As a rule, the owners of the house occupy the extensive apartments on the first floor, while the upper stories are divided into smaller dwellings. In contradistinction to the state of things in France, a stringent building law is in operation. Although the height of houses is limited to 80 ft. 4½ in. from the street, and only four upper stories are allowed, the thickness of the main walls in the foundation is fixed at 2 ft. 7½ in. The cost of building sites varies from 25*l.* to 70*l.* per square yard, and the building of a four-storied house costs about 25*l.* to 42*l.* per square yard.

In Berlin, narrow sites of relatively considerable depth are the rule. The courtyards (which are often to be found) must measure about 17 ft. 6 in. in every direction. The height of the houses is supposed to correspond with the width of the streets, but this is not the case in the wider streets.

In Hamburg the dwellings are, to a certain extent, of a cosmopolitan description, this fact being ascribed to the frequent travelling abroad of its mercantile men. The English style of family dwelling-house is frequently met with, as well as houses arranged in flats. In the

latter cases, it is a peculiarity of Hamburg domestic architecture that all the various apartments are directly accessible from the corridor.

NOTTINGHAM SCHOOL OF ART.

THE annual distribution of prizes in connexion with the Nottingham School of Art took place on the 21st inst., in the Mechanics' Institute.

Lord Belper, who presided, said it was evident that the School of Art in Nottingham was not merely established for the amusement of a certain number of the young people of Nottingham, but was also put to real practical use. He referred to the special prizes for lace designs. He was sure that anybody who knew Nottingham must know how important an industry was that of lace-making in Nottingham. He thought that the result of giving these prizes for lace designs had been most satisfactory. At one time the lace manufacturers of Nottingham had to go abroad,—to France,—for designs; now a large number of Nottingham men were designing for the lace manufacturers of the town, and although there were a few foreigners still, he thought Nottingham would hardly rest satisfied until she could do her own designs sufficiently well that it would not be necessary to employ foreigners any longer. It had often been remarked by those promoting art manufactures that all real good work was hand work. That was no doubt true in olden times, and all hand work no doubt in many ways must be able to compete with machinery, so far as artistic merit went. But in the lace trade of Nottingham they knew that they could make by machinery sufficiently good artistic work; that they produced not only curtains, but other articles of beautiful design and workmanship. The more art knowledge increased throughout the country the more would it be necessary for the manufacturers of Nottingham to employ the best designers they could possibly get in order to supply the demand for artistic work. He was sure that in that respect such a school as that must prove most valuable to assist them in that object.

The Right Hon. Sir R. P. Collier, who had been invited to distribute the prizes, prefaced the performance of that duty by giving an interesting address to the students. In the course of it he said that though almost all industrial art was to some extent decorative, yet some decorative art, such as certain paintings on walls and ceilings, rose rather above the level of mere industrial art. By the term industrial art, he understood the art of making every manufactured article which we use as useful and as beautiful as possible. It dealt with everything that surrounded them, with their furniture, fireplace, coal-scuttles, candlesticks, pottery, and so forth. And, undoubtedly, to be surrounded by a number of beautiful articles, all of which properly answered the purposes for which they were intended, not only added to their comfort, but to their delights, and educated their sense of beauty,—one of the highest faculties given to man. It would be simply to indulge in platitudes if he were to dwell upon the advantages of this kind of art. They knew how it employed labour, how it employed female labour, which he regarded as of great importance. For in this description of art, as in others, women were as well qualified to excel as men. The women were, indeed, treading upon the men's heels, and men must look to their laurels. Further, the branch of art touched upon gave opportunities of discovering genius which might otherwise remain undetected. The matter was one of national importance, for if they were to sustain the daily-increasing competition of foreign nations in the markets of the world, they must improve in industrial art, or they would be left behind by the French and Germans, and by other Continental nations. So far as decorative art was concerned, he knew there were some who thought that our houses were better decorated in the early part of the last century than they were now. There were those who looked back with "longing, lingering look" upon the golden days, as they were called, of Queen Anne, days which, he thought, derived part of their enchantment from the distance at which they were viewed. It might be admitted that some parts of house decoration might have been better done in the reign of Anne and the first George than was the case fifty years ago. But he suspected that about fifty years ago decorative art in this country was perhaps at its lowest. There had been since, however, as they knew, an immense revival. The Great Exhibition of 1851 gave an enormous impetus to this kind of art. From it arose that department of the Privy Council which had now to do with art, and which had various ramifications throughout the country; so that the whole country was, as it were, enveloped in an artistic network. They would do well to recollect to whom they mainly owed that organisation, viz., to the late Prince Consort, who, he believed, had done more for art, certainly for this description of art, than any man who had ever lived amongst them. That industrial art had enormously increased and improved under this impetus was, he thought, patent from what they saw around them in every direction. He was not only referring to the houses of the rich, but the improvement was also, to some extent, evidenced in the cottages of the poor. He understood the Nottingham School of Art to have been founded in 1843, chiefly for the benefit of the artisan class,—for their instruction in industrial art. The school appeared to him to have answered that purpose well. But it appeared also to have extended itself far beyond that purpose, and to have embraced many other, and as they were sometimes called higher, branches of art. He was not surprised at this, for there was an intimate connexion between every kind of art, from the highest to the lowest. It might be said of Art as Virgil said of Fame:—

"Her feet are on the earth, her head is in the clouds."

The clever and industrious youth who now found his foot on the first step of the artistic ladder might mount and mount to the regions of the highest art. It gave him great satisfaction to find that the Nottingham School of Art came second to that of Birmingham in the national competition for medals and for Queen's prizes. It gave him great satisfaction further to find that last year the gold medal was obtained by a young lady [Miss L. A. Levers]. Also that the same young lady had obtained the Princess of Wales's scholarship. He had also heard that students in the school had obtained the scholarship in two successive years. But when he cast his eye down the list he found that not only had they carried off a gold medal, they had obtained silver medals for designs chiefly in lace. The production of lace was one he was sure they would cultivate, as it well deserved to be cultivated. It was certainly one of the most beautiful manufactures in England. Then he found medals for figures from the antique, medals for groups in oil, medals for landscapes, medals for all kinds of decorative designs, numerous medals for lace designs: and he found that the genius of Nottingham did not confine itself to designing lace, that it designed cathedrals. There was a prize for the design of a cathedral [taken by Mr. Hedley J. Price]. The prize list showed very great activity in many very different branches of art. Upon this state of things they were heartily to be congratulated. He confessed that when he saw the list of prizes before him, when he saw so many energetic art students, when he observed the extent to which they had been supported not only by the State but by contributions in the shape of prize studentships and otherwise by a vast number of munificent people, and when he saw so many persons attending to witness the distribution of prizes, all anxious to encourage and stimulate every description of art; and when he recollected that this Nottingham School, although one of the first in the kingdom, was still but one of a great many, he began to think that after all we are something more than a nation of shopkeepers. He began to think that we might aspire to call ourselves an artistic nation.

The Head Master (Mr. Dalgleish) said he should like to say something about Nottingham being second to Birmingham. Birmingham had obtained a larger number of prizes, but while Nottingham had obtained a gold medal Birmingham had obtained nothing higher than a silver medal, so he did not think Birmingham with its 1,000 students had much the best of them. During the past year altogether very satisfactory progress had been made in the school. Much good had been done by the establishment of two scholarships, of the value of 25*l.* each, but there was still room for generosity, there being no library in connexion with the institution, and but two illustrated books on lace.

The prizes were then distributed. The list of them occupies more than a column of small type in the Nottingham *Express*.

THE NEW RAILWAY STATION AT STRASBURG.

PROFESSOR KNACKFUSS, of Cassel (a promising artist of the modern German school) is executing two large fresco paintings as part of the ornamentation of the new railway station at Strasburg. The subjects chosen are from the history of Germany as especially connected with Alsace. The picture on the left of the central hall represents the transportation of the imperial jewels to Hagenau, in the year 1167, by the Emperor Frederick I. The costumes and other incidental features of the work are reproduced from authentic sources. There is an appropriate inscription, "In the old Empire, 1167," intended to contrast with the motto on the other picture, "In the new Empire, 1877." This second picture, on the right of the hall, depicts the festal reception of the Emperor William by the Alsatian peasantry in 1877 at Niederhausbergen. It is expected, according to the *Strasburg Post*, that the first picture will be completed by April 15, and the second by June 15.

MAINTENANCE OF MAIN ROADS.

THE Highways and Locomotives (Amendment) Act, 1878, enacts that one-half of the expenses incurred in the maintenance of main roads should be paid to the local authorities who maintained them by the county authorities, on the certificate of the county surveyor that such roads had been maintained to his satisfaction, provided that the accounts were kept by the local authorities in the form and manner prescribed by the county authority. This provision was made in the interests of parishes of a small rateable value that had a main arterial road passing through them. Around this simple provision has gathered a mass of difficulties that form a monument to the ingenuity of county authorities in endeavouring to evade what seems to be the obvious meaning of the Act. Upon the construction of the word "maintenance" a wonderful diversity of opinion and practice exists. Some county authorities hold that it does not include watering the roads, and they refused to pay those parts of the accounts of local authorities relating to this head, although the same may have been audited by the Local Government Board. We believe that the Brentford Local Board intend to raise this question with the Middlesex County Authority, and will no doubt endeavour to show that the "maintenance" of a road includes everything that is necessary to maintaining it in a condition fit for persons and vehicles to travel over it. It seems reasonable to contend that laying clouds of dust by watering is a proper item in the maintenance of any road. The vexed question of whether the removal of snow in order to maintain the roads in a passable condition is part of their maintenance has been settled by the decision of the Court of Queen's Bench on the 14th inst. in *Amesbury Union* v. *County of Wilts*.

In this instance an expense of 150*l.* was admittedly incurred in making the main roads passable by removing a very heavy fall of snow, and the county authority refused to pay any contribution towards that expense. The Court unanimously held that it was part of the maintenance of the road, and gave judgment for the local authority. Another word on which county authorities take different views is "road." The county authorities of Derby and Stafford treat it as including the carriage-way and foot-ways, while the Middlesex county authority read it as including the carriage-way only, and on the form of accounts prescribed by them the local surveyor has to solemnly declare that his account does not include any of the cost of maintaining the footways. If the County Boards Bill of the Government brings into being authorities who will take a rational view of the statutory obligations, they will confer a benefit upon the country at large if the general business of the existing bodies is done in the same manner as that relating to main roads.

The Flooding of Strood.—Strood has been again invaded by the tide, and sad accounts reach us of the sufferings endured there, especially by the poor. There must be some great dereliction of duty on the part of the Corporation. That this injury is preventible no one doubts; it is simply a question of money. Could not the Local Government Board usefully interfere?

MONUMENTS OF ARABIAN ART IN EGYPT.

A COMMITTEE has been nominated by the Khedive for the purpose of preserving the remains of Arabian art in Egypt. The president is the Egyptian Wakuf Minister, and there are ten native members, including the Ministers of Foreign Affairs and Public Works, and four Europeans, among whom is M. Jules Bourgoin, author of the well-known work, "Les Arts Arabes," the English numismatist, Rogers Bey, and a German, Franz Bey, who holds the office of Conservator of Arabian Monuments. This chief committee has to nominate two commissions. The first of these will be charged with the task of making a complete inventory of Arabian monuments, while the second will have to ascertain what remains require to be preserved in museums in order to prevent their complete destruction. All decisions as to what is to be done in either class of cases rest with the chief committee, which is assisted by two secretaries and a keeper of archives. The technical department of the Wakuf Ministry will be instructed to furnish all plans required, and to execute the work of restoration in all cases ordered by the committee. For this purpose a special department, with a staff of draughtsmen, has been established. The funds at present at the disposal of the committee are only 195,000 francs. The members of the committee are unpaid. It meets once a month, seven forming a quorum, but no decision can be taken unless the president or his official secretary is present. There is every prospect that under this body a long-neglected and much needed work will at length be efficiently performed.

COPENHAGEN.

IT is somewhat singular that it is chiefly since Denmark lost the rich and populous provinces of Holstein and Schleswig that the capital of the little kingdom has attained a degree of prosperity never equalled in former times. Within the past quarter of a century Copenhagen has nearly doubled its population, having risen from 150,000 to close upon 300,000 souls. The great progress that has been made dates, in fact, from the period twenty-five years ago, when the city obtained greater powers of self-government. Twenty-five years back the place was surrounded by a wall, outside which stretched the glacis of the fortifications. The suburbs, which were thus entirely separated or cut off by a broad belt from the heart of the city proper, were comparatively small and straggling, consisting of here and there a few streets or groups of houses, standing among cornfields and gardens. There were few policemen to be seen in the streets, and at night the watchmen kept up the custom of calling out the hours as the clock struck, and passing the intervals in dozing in the doorways. The precautions against fire were very primitive, and when there was a conflagration the whole city was aroused by the beating of drums, the ringing of bells, and the blowing of whistles. Gas-lamps, to illuminate the streets, were not introduced until the year 1857. The means of locomotion were very limited, being almost confined to the lumbering omnibus which ran a few times every day each way between Copenhagen and Fredericksburg. There was no trace of a tramway at that period. In the last two and a half decades all this has been altered. The streets are now full of life, and the city has expanded in all directions. One million and a half kronen (a krone or Danish crown is equal to about 1s. 1d.) have been spent since 1864 in carrying out a main drainage system. The municipal budget which, twenty-five years back, amounted to little more than 1,000,000 kronen (1,080,000 exactly), is now 6,000,000. The school system, in 1857, cost only 184,000 kronen; now it costs 900,000. The police then cost 120,000 kronen; now they cost 600,000. While the city has been increasing 100 per cent. in size and population, it has fortunately also seen the general prosperity of the inhabitants likewise increasing. This is shown by the Poor-law returns, which state that in 1858 there were nearly 7 per cent. of the population dependent on the public poor-houses for their subsistence, the poor-rates then amounting to 5·9 kronen per head of the inhabitants. Now, on the other hand, the number of the poor is only 3·7 per cent. of the population, a reduction of nearly 50 per cent., and the rates have at the same time fallen to 5·3 kronen per head of the citizens. Altogether the condition of Copenhagen is very satisfactory, and there is reason to believe that its prosperity in the immediate future will be still further increased, owing to the mistaken protective legislation of the great neighbouring empire of Germany.

GERMAN SANITARY CONGRESS.

THE German Society for the Promotion of Public Health which was to have met last year, but whose meeting had to be postponed through the burning down of the Hygienic Exhibition, will assemble in Whitsun Week this year from the 16th to the 19th of May. The principal address will be delivered by the physiologist, Professor Virchow, on the 17th of May, his subject being, "What Use should be made of the Sewage or Refuse of Cities?" Immediately after the discussion on this paper, the members of the Congress will proceed in a body to visit the estates on which the sewage of Berlin is employed. Another question which will be dealt with by the Congress is the quality of drinking-water and water used for domestic purposes, and how to test scientifically whether it is wholesome or deleterious to health. On this subject Dr. Wolfhügel and Dr. Tiemann will be the most important speakers. The question of different systems of artificial illumination and their bearings on health will also engage the attention of the Congress.

MONASTERY OF SAN JUAN DE LOS REYES, TOLEDO.

ENTRANCE DOOR OF CHAPEL.

IN the month of May, 1475, King Alfonso V. (el Africano) of Portugal invaded Estremadura at the head of an army consisting of 6,000 cavalry and 14,000 infantry, in his war against Isabel and Ferdinand, undertaken with a view of defending the supposed rights of his niece Isabel (la Beltraneja), whom he had married, although she was scarcely thirteen years of age, on the 12th of the same month, at Plasencia, proclaiming himself, with due solemnity and the customary festivities, king of Castile. His pretensions were supported by many grandees of Castile; but his success was of but short duration. In the battle of Toro (March 1, 1476), King Ferdinand, at the head of 10,000 troops, routed King Alfonso of Portugal completely, who lost in the sanguinary battle most of his cavalry and 4,000 infantry, killed, wounded, and prisoners. When Queen Isabel received the agreeable news from her husband at Tordesillas, she repaired at the head of a grand procession, dressed in rude garments and with bare feet, to the church of San Pablo, to render thanks to God for the triumph of the Castilian arms, and there made the solemn vow to erect the monastery of San Juan de los Reyes at Toledo. This is the reported origin of that building, which was constructed under the direction of the architect Juan Guass, as appears from an inscription and a mural painting recently discovered in the Church of San Justo y Pastor in the same city.

Mr. Fergusson says of the church or chapel attached to the building, and of the entrance-door of which we give an illustration in this week's *Builder*, that, among the minor chapels of the age, it is, perhaps, the most remarkable, and that it was built by Ferdinand and Isabel as a sepulchral chapel for themselves. "It is thus," he continues, "the exact counterpart of our Henry VII.'s Chapel, and of the church at Bron en Bresse. As its founders were at the time of its erection among the richest and most prosperous sovereigns in Europe, all that wealth could do was lavished on its ornamentation. It is as rich as our example, and richer than the French one. But, on the whole, the palm must be awarded to the English architect. There is more constructive skill, and the construction is better expressed, at Westminster than either at Toledo or Bron; though it is difficult not to feel that the money in all these cases might have been better expended on a building of a purer style of art."

The Spanish building is in the florid ogival style. The principal portal, which we illustrate, is on the north façade. It was erected from the plans and under the direction of Señor Alonso de Covarrubias, but was not finished until the year 1610. In the arches of the wall of this door there hang numerous rusty iron chains. They are those which oppressed the captive Christians of Almansa, Loja, Malaga, and Baza, liberated by the victorious arms of the Catholic kings. The best portion of San Juan de los Reyes was its monumental monastery, admired by all who visited it. This was destroyed by Bonaparte's soldiers, who set fire to it on December 14, 1809. The building, or what remains of it, is to be converted into a school of industrial and decorative art.

SKETCHES IN ITALY.

TRIFORIUM TRACERIES, LUCCA CATHEDRAL.

THE sketches we have illustrated were executed by Mr. Roger T. Conder, in the course of a trip, as Soane Medallist for 1881, through Italy.

The Cathedral at Lucca was originally a Romanesque building, but has been so often altered and restored that inside it presents a decidedly Gothic appearance. The triforium traceries here represented attract the visitors' attention immediately on entering the church, and a charming effect is gained by continuing these traceries, — supported, of course, on columns and arches,—across the transepts, and longitudinally over the centre of the same. The vaulting is covered with frescos, which were restored in 1858. The capitals supporting the arches of the vault are extremely bold and effective, though to many minds the acanthus-leaf in juxtaposition to Gothic tracery will always be an abomination.

THE PALAZZO CONTARINI FASAN, VENICE.

This small palace, on the Grand Canal at Venice, almost immediately opposite the Church of Sta. Maria della Salute, is apparently of the fourteenth century. It is of brick and stone, the lower story being covered with plaster. The brickwork has been coloured by time. Though small, this palace is one of the most charming in Venice, owing to the good proportions of every detail, and to the richness of the carving both on the arches and to the tracery of the balconies. In the rage for fixing upon residences for all celebrities, this house has been called the house of Desdemona.

FINCHLEY BOARD SCHOOLS COMPETITION.

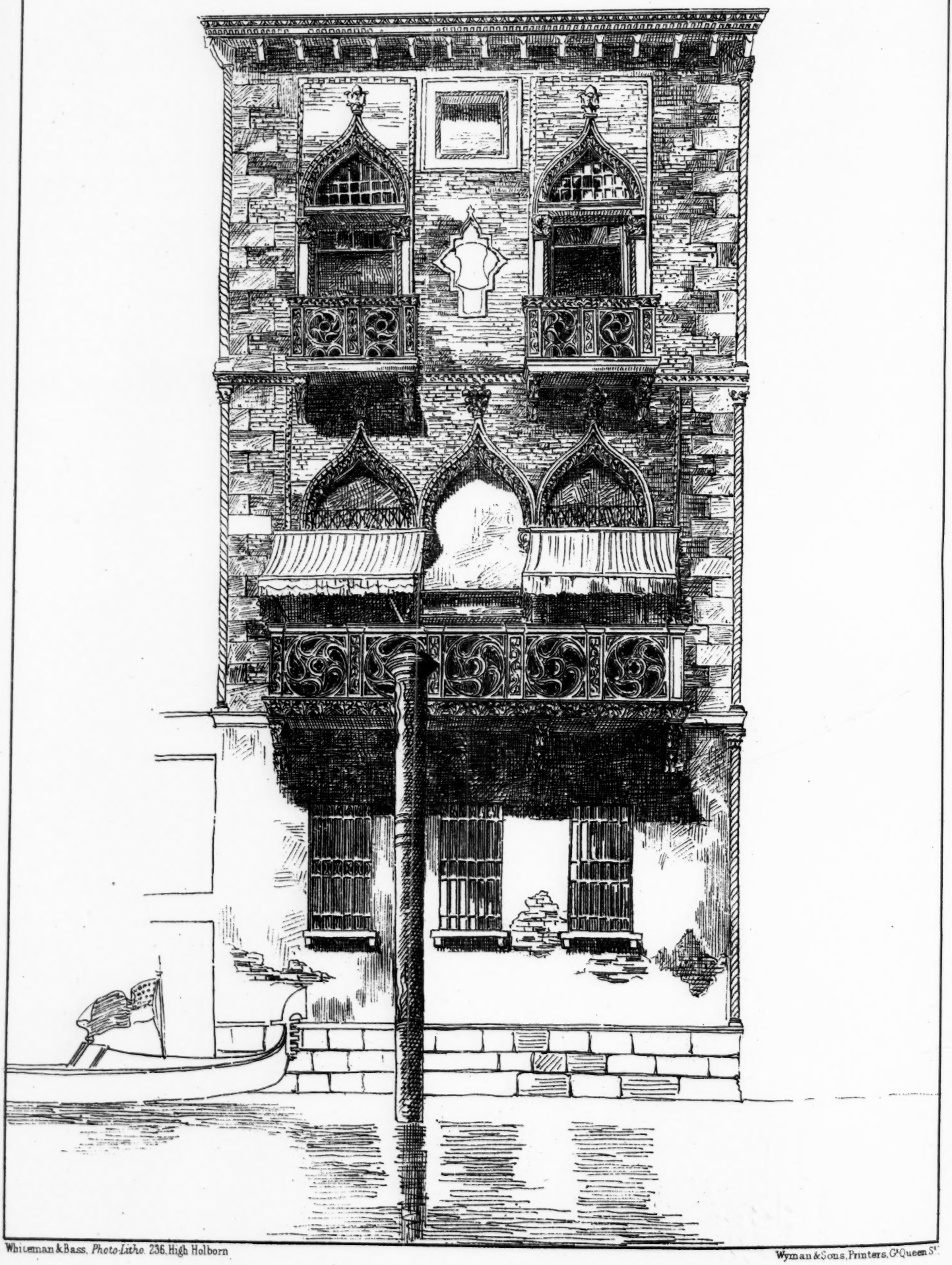
WE illustrate in our present number Messrs. Dunk & Geden's designs which gained the first premium in the late competition. Professor T. Roger Smith was the professional referee.

The requirements, as stated in the instructions to architects, were a graded school for 840 boys and girls, and an infants' school for 600 apart from the graded school. The graded school to consist of central hall and fourteen class-rooms communicating therewith, each class-room to hold a minimum of sixty children; an allowance of 10 square feet of floor-space in the class-rooms to each child; designs to be arranged so that half the accommodation only can be provided for at present; central hall and class-rooms to be erected wholly as ground-floor; partitions dividing the class-rooms from the central hall to be movable, and of glass from a height of 10 ft. from the floor; a laboratory, kitchen for cookery instruction, masters' and mistresses' rooms to be provided; economy of construction to be specially studied.

In the design illustrated, picked stock bricks will be used with red brick and stone dressings. The roofs to be open inside as high as the collar, and boarded and felted on back of rafters, and the timber left clean from the tool, without paint or varnish. The floors, laid with Wharam's wood blocks on concrete bed; heating by low-pressure hot-water system; ventilation by Tobin's shafts opening over hot-water pipes and extract-ventilators; pivot casements in all the windows.

We are informed that the Board having now altered their requirements on economical grounds, the present plans will have to be modified and reduced before being carried into execution.

The Sanatorium, Virginia Water.—Messrs. J. W. Bird & Co. have just now supplied polished vein and St. Ann's marble seats and wall-linings for the Turkish-baths at the Holloway Sanatorium, Virginia Water; also a solid polished Sicilian marble basin and pedestal for the shampooing-room.

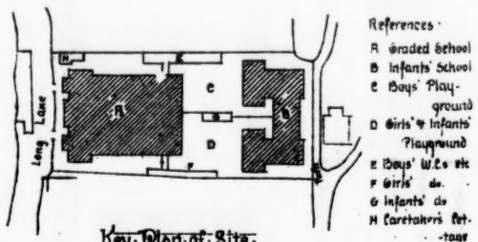


Whiteman & Bass, *Photo-Litho.* 236, High Holborn

Wyman & Sons, Printers, G^t Queen S^t.

Palazzo Contarini Fasan Venice

Sketched by R.T. Conder 1882



Key Plan of Site.

References.

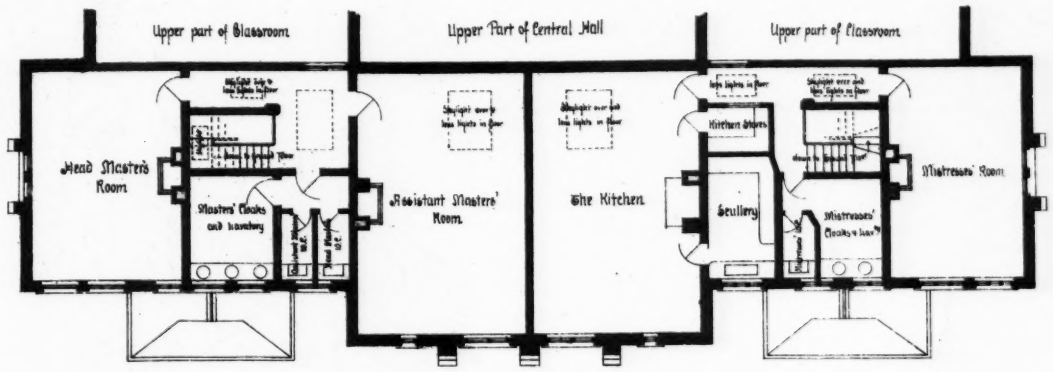
A Graded School
B Infants' School
C Boys' Playground
D Girls' & Infants' Playground
E Boys' W.C.s &c
F Girls' do.
G Infants' do
H Caretaker's Cottage

New Schools for the Finchley School Board.

Bunk.s Geden Archts.

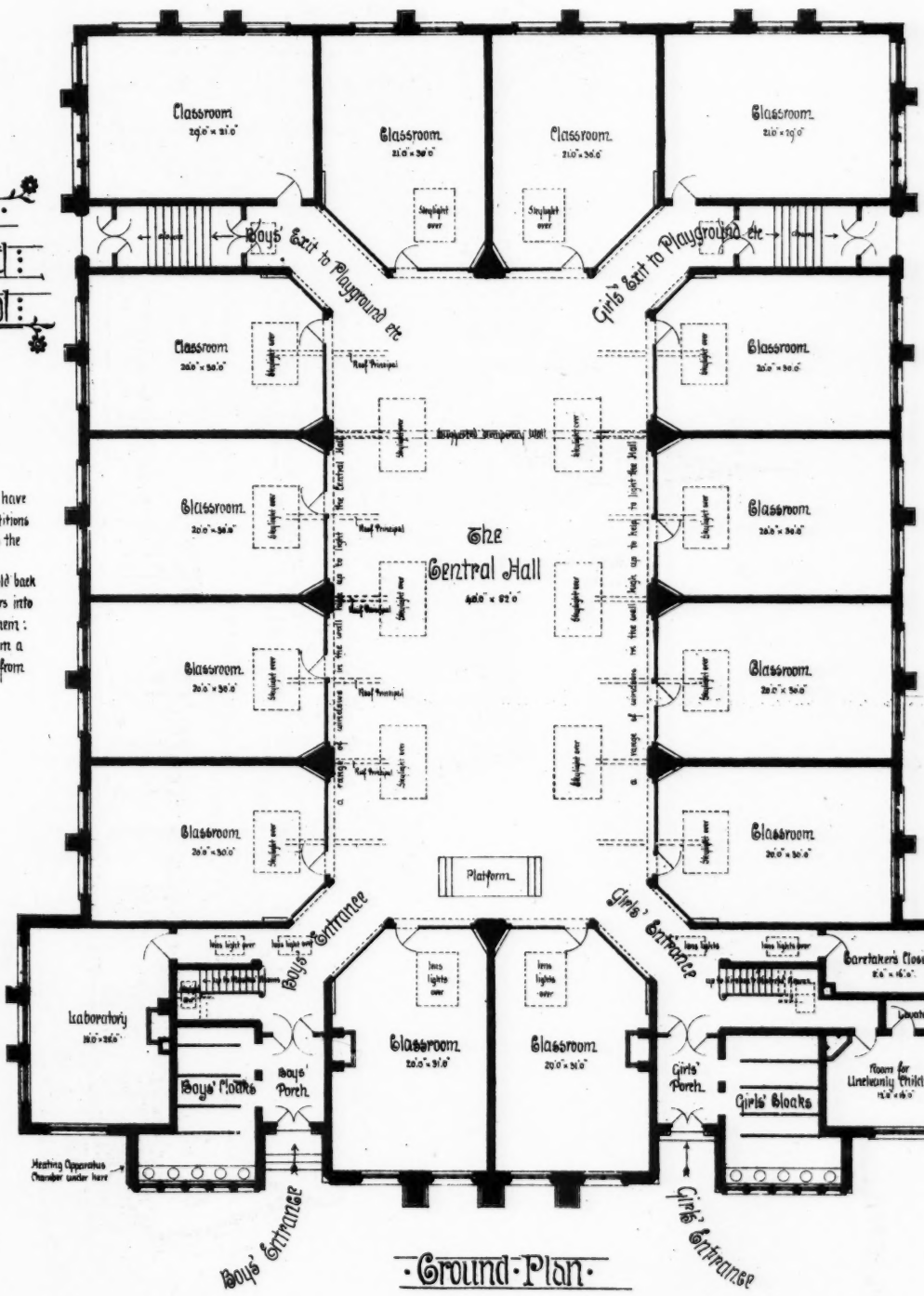
C.F.Kell, Photo-Litho. Castle St Holborn, London, E.C.

Wyman & Sons, Printers, Gt Queen St.



First Floor Plan

The Graded School



Ground Plan

Note:
All the Classrooms have hinged moveable partitions on the sides next to the Central Hall:
These Partitions fold back like ordinary shutters into boxes provided for them: and are of glass from a height of four feet from the floor:

Note:
This design has been specially prepared so that just so much Accommodation may be provided at present as desired: and the rest very simply added at some future period without interrupting in any way the work of the School:

Thus eight Classrooms might be erected now: a temporary wall being built across the Central Hall as shown:

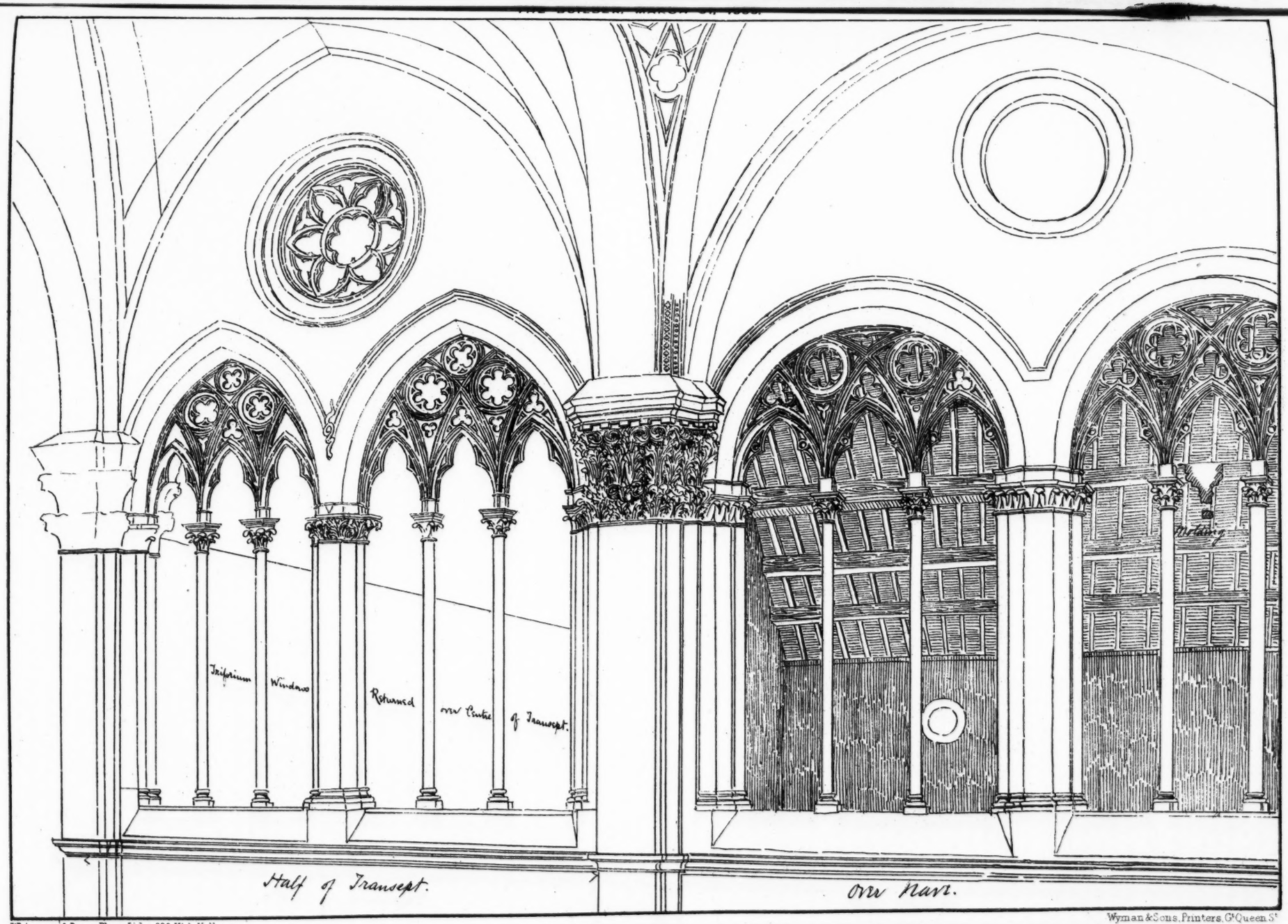
Or six Classrooms only might be built now:

C.F.Kell, Photo-Litho. Castle St Holborn.

Wyman & Sons, Printers, Gt Queen St.

NEW SCHOOLS FOR THE FINCHLEY SCHOOL BOARD.

ENTRANCE-DOOR, SAN JUAN DE LOS REYES, TOLEDO.—Señor Alonso de Covarrubias, Architect.



Whiteman & Bass, *Photo-Litho.* 236, High Holborn.

Wyman & Sons, Printers, Gt Queen St.

Triforium Traceries Lucca Cathedral

Sketched by R.T. Conder 1882

PRIZE COMPETITION FOR A NEW "NORTHERN MUSEUM" IN STOCKHOLM.

THE Swedish authorities have issued to the architects of all countries an invitation to send in designs and plans for a new building for the "Northern Museum" of Stockholm. The drawings are to be in the hands of the Museum Committee before the 1st of June. They are to be anonymous, but capable of identification by help of a motto in the usual way. The judges will be the Museum Committee, assisted by two eminent architects. The authors of the five best designs will receive premiums of the value of 1,500 kronen (84*l.* 7s.) for the first, 600 kronen (33*l.* 15s.) for the second, and 300 kronen each for the third, fourth, and fifth. The five prize drawings will be the property of the committee. The building is to be erected in the Royal Park at Stockholm. The problem which the programme puts for solution by the competitors is one of considerable interest. The committee does not mention the sum it is prepared to expend on the new building.

UNDERGROUND PARIS.

"ARCHÆOLOGICAL discoveries," says a French journal, "have their destinies as books have. Some, coming at an opportune moment, achieve success at once; some, at an inopportune moment, but half the success they merit." Such, up to the present, has been the fate of the discovery of the famous Amphitheatre of Lutetia.

Thanks to the courtesy of Monsieur Meygret, the contractor for the demolitions necessary for the formation of the new Rue des Arènes, interesting researches have been possible in the vast plot of ground at the top of the Rue de Navarre (once Rue Rollin), and bordering on the Rue Monge, across which the new street, going from the Rue Monge to the Rue Linné, is to be laid down.

These researches have already brought to light this celebrated amphitheatre, which is found to be in the very spot secular tradition had always asserted it to be; that is, in the "Inclosure of the Arenas," one of the numerous plots of ground inclosed by walls, which succeeded on the inclines of Mount Leucotitius to the Parisian villa of the Gallo-Roman epoch. The line traced for the Rue Monge encountered in 1869 these curious substructures nearly at the top of the Rue Rollin. Researches were immediately instituted by the delegates of the city for archæological service, and they were not long in disinterring nearly the half of the edifice. The rest was, and is still, buried under the garden of a convent, once belonging to a Sisterhood of Jesus Christ. Unfortunately for science, the Rue Monge had been opened by a private company, in which the city had no rights, and the spot where the arena is now found to be was sold to the General Omnibus Company, who established a station there, though with the understanding that the buildings were to be light and without deep foundations. The question then was how to re-purchase the plot of ground from this rich company, and negotiations were entered into which might have succeeded, had it not been for the declaration of war with Germany. The events of the moment caused the matter to be put on one side. Meanwhile, the company built its stables, offices, &c., and the first substructures all Paris went to see are nearly destroyed.

But the happy incident of the new discoveries has once more drawn public attention to the subject. This street to be opened between the Rues Linné and Navarre (*ci-devant* Rollin) would cut through the convent garden (the Sisterhood are no longer there, having retired to Orleans, and the ground was bought by the late Madame Blanc, who had made it into a depository for valuables to the amount of six or seven millions of francs), underneath which is still buried the half of the amphitheatre. The Institute is impressed with the importance of a probably still more extended discovery, and the question was brought a few days ago before the Academy of Inscriptions and Belles Lettres, by Monsieur Leon Renier, and is to be further submitted to the Prefect of the Seine and the Municipal Council. The issue, of course, is still doubtful, but what one can affirm is that there are few archæological causes more worthy of being pleaded. Paris has lost nearly all her old monuments. The Thermes is the only one remaining of the Gallo-Roman town, and the arenas were of equal importance. Julian, as well as Constantine Chlo'rus, held their court there. In them the Merovingian chiefs gave gorgeous spectacles. The Parisian dignitaries held their assemblies there also, and later the site was made a necropolis. In the North of France, says Leon Renier, the Gallo-Roman Amphitheatre of Lutetia has perhaps no rival in antiquity other than the Gate of Mars at Rheims.

Let us hope the Institute may succeed in saving what remains of it. Furnished with a very curious and very exact map of the Amphitheatre of Lutetia, the delegates of the city for archæological service, Messieurs Cousin and Vacquer, are actively prosecuting their researches, and we may hope that before long the amphitheatre will be completely exposed to view.

THE DISINFECTION AND DRYING OF INUNDATED HOUSES.

THE Prussian Government lately issued a comprehensive series of regulations for the guidance of sanitary authorities in the measures which are rendered necessary by inundations. An extract to the following effect is published by the *Deutsche Bauzeitung* as being of special interest fo the building trade, from a technical point of view.

After the water has receded, a thorough cleaning of the dwelling-houses in all their parts is necessary. As the water has often been mixed with dirt and the overflow of sewers, the walls and floors of the rooms and offices of such dwellings are rendered in an unsanitary condition. In such cases the removal of the surfaces thus affected is not always practicable, and therefore recourse must be had to disinfection. The doubts which have of late been currently expressed as to the efficacy for that purpose of carbolic acid and vitriol need not prevent the use of these substances, as it is not here a question of killing specific germs of disease, but merely of preventing the decomposition of organic substances. Of course, the surfaces only are subjected to the influences of the acids referred to, and further operations are necessary when the boards are in any way defective, and when the filling underneath has been wetted or has received deposits of a noxious character. Even in the former case, if the material has not been perfectly clean from the beginning, a slow process of decomposition is liable to set in, and the material must in such cases be replaced by a dry and suitable filling substance. A thorough disinfeetion is hardly possible. The removal of damp filling is also rendered advisable by the fact that the boards would become rotten if left in proximity to it.

As to the water which may be in cellars, the opinion has been expressed in some quarters that the pumping out of it need not take place when an influx of underground water prevents the drying of the cellar. This theory may be correct when the water comes entirely from below. When, however, water has been flowing in from above, it is to be supposed that it is not free from impurities, and in such cases it is recommended to pump out as much as possible and to disinfect what remains. Cellars which are used for storing provisions are more conveniently disinfected with green vitriol than with carbolic acid, inasmuch as the odour of the latter would be imparted to the provisions which might afterwards be placed in it, thus rendering them unfit for consumption and for sale. The underground water can be left standing in the cellars until the general sinking of it allows of its being thoroughly pumped out, and of the removal of the sediment which has been deposited.

The removal of the plaster from the walls is serviceable because the drying of them is thereby much accelerated, and because the removal of impurities is in this way better insured than by washing the walls with disinfecting substances. The drying of the walls is best effected by the use of iron baskets containing coke. Danger of fire is averted by the flooring being covered with a layer of sand an inch or two in height. The sand also becomes heated in a marked degree, and the drying of the flooring is thereby facilitated. Precautions are necessary against any person being poisoned by the fumes which are generated.

The question has often been raised whether it is preferable to use this method with the windows and doors closed or opened. The former system is in itself desirable because the heat in the rooms is thereby increased, and the introduction of natural ventilation through the pores of the brickwork is promoted. It is, however, only practicable to employ this method of drying when a proper means of escape is provided for the heated air, which is saturated with aqueous vapour. This is best effected by an opening into a heated chimney. Otherwise the necessary changing of the air is to be effected by keeping the doors and windows open.

THE SUN AS A SOURCE OF POWER.

OF the enormous power of the sun's rays few readers have any adequate conception, but as the time appears now to be approaching when they will be capable of being made directly available in place of coal and steam for the production of power and light, the question is beginning to assume something more than a theoretical interest. The French electrician M. Deprez, in a recent work, makes some calculations which illustrate the enormous fund of force which the sun's heat is capable of supplying. France, he says, possesses an area of about half a million square kilomètres. In one hour the sun's heat will absorb or dry up 2 lb. of water per square mètre, and so on a fine summer day the quantity of water the sun is capable of absorbing in one hour over the entire area of France is not less than a thousand milliards, or a million millions of pounds avoirdupois. If we had to raise this quantity of water to boiling point in boilers, we should require no less than sixty million tons of coal, which is one-fifth of the entire annual production of coal throughout the world. The sun's rays falling on France would be able to turn so much water into steam as would keep going eighty million locomotive engines of collectively forty milliards of horse-powers.

PANCLASITE.

A NEW explosive agent has been invented by a French chemist, M. Turpin, to which the name "Panclasite" has been given. In addition to being much more powerful than any hitherto existing material, Panclasite has the advantage of not being liable to explode through a mere knock or percussion. In fact, its principal feature is that it consists of two fluids, each of which can be conveyed separately by rail or on shipboard with perfect safety. The explosive quality only arises from their mixture, and the two fluids can be kept separate until the moment when they are wanted for use. The mixed fluid can be employed either directly in the fluid form, or, like the nitro-glycerine in dynamite, it may be first absorbed into some porous kind of earth, and so applied in an apparently solid form. Panclasite does not freeze at any ordinary temperature, so that the dangerous operation of melting, which is necessary in the case of dynamite, at +8° centigrade, is avoided.

Experiments have been made with panclasite at Cherbourg on old cement work and on a quartzose slate rock. The result was such that the engineers, in their report, stated that "the mixture prepared by M. Turpin bears, as regards its effects, the same proportion to dynamite as dynamite does to ordinary gunpowder." All these details, however, require further corroboration before they can be accepted as final.

LUNATICS IN A PRIZE COMPETITION.

THE results of the Italian prize competition for a monument to Victor Emanuel, last year, were not a little surprising to all who took an interest in the matter. Out of the 296 designs that were sent in, the judges found that only about two dozen were of sufficient merit to be admitted to the narrower competition, all the rest being rejected at the first inspection as unsuitable. Recently, an Italian physician, Dr. Dossi, who is well known for his labours in the psychiatric field, has published in the "Archives de Psychiatria" a statement which has caused considerable astonishment in and out of the Italian kingdom. He announces that of the 296 designs sent in no fewer than thirty-nine were the production of notorious lunatics. It would be interesting to learn whether any of these thirty-nine were included by the judges in the twenty designs admitted to the narrower competition, but on this point the learned doctor leaves us in ignorance.

FIREPROOF SCENERY.

A TRIAL of Herr Pafen's system of rendering theatrical scenery fireproof was recently held at Frankfürt, in presence of the theatrical officials, the Municipal Building Committee, and the Fire Brigade authorities. According to the *Hamburger Nachrichten*, the experiments (which took place at the Opera-house) were conclusive in demonstrating the efficacy of Herr Pafen's method, which, it states, has been adopted in the Court theatres at Berlin, Hanover, Cassel, Wiesbaden, Carlsruhe, and Mannheim. The Erfurt and Stettin theatres have also decided on introducing it.

EDINBURGH ARCHITECTURAL ASSOCIATION.

AT the last fortnightly meeting of the above association, the President, Mr. MacGibbon, in the chair, after the preliminary business was disposed of, Mr. D. W. Stevenson, A.R.S.A., read a paper entitled "System and no System in Art Education," in the course of which a comparison was made between the opportunities for obtaining education in their art, at the disposal of students of architecture in Edinburgh, London, Paris, and Rome; details being given of the architectural section of the schools of the fine arts in each of these cities, that of Paris being the most complete. Out of seventeen professions in the National School there, ten were more or less directly connected with architecture. The progress of pupils was tested, and their zeal stimulated by frequent competitions, while prizes to the amount of 150*l.* a year, the income of legacies left to this department of the school, were at the disposal of the directors; and in addition the grand prize of Rome, each year granted by the Government, enables the winner to spend three years in Rome; where recently a pupil of this school,—M. Nenot,—gained the premium of 2,000*l.* offered by the Italian Government for the best design for a memorial to King Victor Emmanuel. This fact was considered a practical comment on the neglect of the study of architecture in the schools of art at Rome at present. The Royal Academy of London had, since 1870, well-equipped classes for architecture; and classes also existed at Kensington, but nothing to be compared with the complete organisation of the French School was to be found in this country, while in Edinburgh the student of architecture was left to fight his way single-handed through difficulties which only the most enthusiastic could overcome. Provision for affording the students of architecture in Edinburgh a more systematic course of study was urged, not only on the attention of the profession, but the public.

At the conclusion of the paper, a hearty vote of thanks was accorded.

On Saturday afternoon the members of the association, to the number of sixty-five, travelled to Dalkeith for the purpose of visiting the old Collegiate Church, which stands on the north side of the High-street of the burgh. The company were met at the entrance gate to the church by Mr. Inglis, the clerk of works, and directed through the building. In the course of their examination, Mr. M'Gibbon, president of the association, read a few notes which had been prepared by Mr. Stewart, chamberlain to the Duke of Buccleuch, respecting the edifice. The first structure on that site was erected in 1368, and was dedicated to St. Nicholas. It was 78 ft. long, 53 ft. wide, and 35 ft. high. The tower was 85 ft. high. In 1406, Sir James Douglas rebuilt the chapel, and it was formed into a collegiate church in 1477, under the deanery of Restalrig and diocese of St. Andrews. That deanery was dissolved in 1592. The church was rebuilt in 1767, and upon one of its two bells there is a Latin inscription, "Decora domine tuæ sanctitas O Jehova Dierum in Longitudinem; John Milne, facet., Edinr., 1768." In 1854, the Duke of Buccleuch caused extensive repairs to be made on the western division of the building, and it was then rendered more comfortable for a place of worship. The walls of the choir, however, are roofless, and nothing of the internal furnishings remain; even the stones of the floor have been removed. On the north side of the choir is the vault belonging to the Duke of Buccleuch family. It contains many ancestral remains, beginning with the second Earl, who died in 1651, down to the late Duke of Buccleuch, who was interred there. The recumbent sculptured figures of the first Earl of Morton and his Countess, much defaced by the action of the elements and broken, are lying in the choir. The company then adjourned to Dalkeith Park, where, after looking into the elegant little chapel erected within the grounds, they proceeded to the mansion-house of his Grace the Duke of Buccleuch, where they were shown through the principal apartments.

SALE OF FRESCOS.

SEVERAL Italian newspapers allude to the purchase, at a high figure, for the Louvre at Paris, of the celebrated fresco, "Christ on the Cross," by Fra Beato Angelico, which has been in the refectory of the Dominican monastery at Fiesola. Another fresco, by the same master, is said to have been bought by the Grand Duke Sergius of Russia for 1,800*l.* The confiscation of the building referred to seems to have recently taken place.

"AN ARCHITECT ON LAWYERS."

SIR,—Your second legal correspondent on this subject (last week) appears to be chiefly bent upon making us merry; but he contributes one remark that may be said to afford us material for reflection. I observe that he does not know what a false issue is, unless it be "a false fact," which is a pity. Then he seems to be quite inclined to doubt whether brick is an incombustible material after all, which is surely a joke. He takes wood-bricks to be "blocks used for wood paving," which again is to be regretted. He is of opinion next that an arbitrator on a carpenter's bill deserves our sympathy rather than our ridicule when he speaks gravely of a "*ledged door-lock*," because there is no comma in his copy of the account. Once more, he tells us with all simplicity that the task of an architectural arbitrator (an "architect and surveyor" of course), in dealing with a builder's bill, is "to decide between the *price asked* and the *price offered*, and this he does *upon evidence*,"—just as if he also were "only a lawyer." Lastly, he refers with approval to the well-known "false fact" that a lawsuit is cheaper and more expeditious than an arbitration; and this is the point upon which I will ask leave to say a word or two. I admit that a reference to a barrister is neither cheap nor expeditious. I admit that a reference to an architect, with counsel and solicitors on each side, and "advocates on oath" to assist them all round in making the worse appear the better reason, is neither cheap nor expeditious, however much better it may be in both respects than the former process. But I assert that a lawsuit, when so conducted that it may, with whatever grim irony, be called cheap, is dear at any price, being no better than a toss up, which is the cheapest and most expeditious of all processes; and I further assert that, in the hands of a conscientious and experienced architect or surveyor, who is permitted to dispense with lawyers and expert witnesses, an arbitration is always found to be as much more cheap and expeditious than a lawsuit, as it is unquestionably more satisfactory in every other way. No amount of jocose legal raillery and pleasant legal mystification will alter the universal opinion of the building world that litigation, when applied to building disputes, is a failure; and I repeat that I think the time has come for architects who are inclined that way to learn the practice of arbitration academically, as part of their business. I will add, for the satisfaction of your legal readers, that I include, of course, the necessary "law" in the curriculum; but how much more there must be besides law I need not say. May I take the opportunity of adding an expression of my individual opinion as to the best form for a building arbitration? Let there be (1) the delivery of statements in writing by the parties and their witnesses; (2), the delivery of replies; (3), examination *vivâ voce* by the arbitrator alone; (4), in many cases, an attempt on his part to adjust terms of friendly settlement; and (5), the delivery of an award, which in some cases shall be open to appeal, and which in no case shall be dictated by that consideration of the arbitrator's own interest, or want of interest, which is sometimes so exasperating to both sides. All this may be perfectly cheap and expeditious. I am not in favour, I ought to add, of much appealing, nor even of too much explanation; but I cannot help approving the process of a lawsuit, so far as the absence of judicial secrecy is concerned, as well as the recognition of the possibility of judicial error. ROBERT KERR.

"WRIGHT, OF DERBY."

THE idea of exhibiting in Derby as complete and representative a collection of Wright's pictures as it was possible to gather under one roof has at length been successfully carried out, thanks mainly to the energy of Mr. William Bemrose. The Corporation Art Gallery was chosen as the repository of the loan collection, and here, for some weeks past, Mr. Bemrose, assisted by Mr. Alderman Sowter and Mr. Thos. Heath, has been busily at work in receiving and hanging the pictures. The Mayor of Derby (Mr. Councillor Russell) marked the opening of the exhibition by issuing invitations to a *conversazione* on the 21st inst. The Mayor made an interesting speech on the occasion, detailing some of the particulars of Wright's career, callling upon "another Derbyshire worthy," Mr. Seymour Haden, to say a few words on the collection now brought together. Mr. Haden, however, said it was not necessary for him to say anything, as Wright, fortunately, spoke for himself in his pictures.

The following brief account of the artist's life is culled from the pen of his appreciative kinsman, Mr. William Bemrose.

Joseph Wright was born at Derby, in the house, No. 28, Iron-gate (better known as Simmonds's Eating-house), on September 3rd, 1734, being the third son of Mr. John Wright, attorney-at-law, who filled the office of town clerk of Derby from 1758 to 1765. In the town of Derby Wright was born and made his "name and fame," and it is not surprising, therefore, that he has become universally known as "Wright, of Derby." He was educated at Derby School, under the Rev. Mr. Almond, and, at an early age, was passionately devoted to the pursuit of drawing. In 1751, being seventeen years of age, he was placed by his father with Hudson, the master of Reynolds and Mortimer, where he remained for two years. On his return to his native town, he painted many portraits,—his father, and mother, and other members of his family amongst them. In 1756, he returned to study with Hudson for a further period of fifteen months, and in 1765 first exhibited paintings at the Incorporated Society of Artists, and at the Royal Academy in 1778. In 1781, Wright was elected an Associate of the Academy, and a full member in 1784, but declined the latter honour, for reasons which have been variously stated. In 1773, he married and went to Italy, where, during his studies, he saw a memorable eruption of Mount Vesuvius,—a scene which is said to have inspired him to follow the painting of strong effects of light and shade, in which he afterwards became so pre-eminently successful. In 1776, Wright left Derby for Bath, but, not meeting at that fashionable resort with the support which was his due, he returned to his native place, where he was honoured with an exceptionally large number of commissions direct from the easel. In 1779, the artist removed to Old St. Helen's House, opposite the present Derby School, then almost outside the town. In May, 1797, Wright became so ill that he took to his bed, from which he never rose again, but succumbed to a complication of diseases on the 29th of August, 1797, at a house in Queen-street, and was buried on the 1st of September following, in St. Alkmund's Church. Here a tablet still exists to his memory with the following inscription:—

> In the middle aisle, opposite to this pillar, are deposited
> the Remains of
> JOSEPH WRIGHT, Esq.,
> Painter.
> He died Aug. 29th, 1797, in the
> 63rd year of his age.
> His well-earn'd merit in his works is shown,
> Where taste and genius mark him for their own.

The catalogue of the exhibition, on which Mr. Bemrose has expended well-nigh two months of patient labour, contains an amount of detail personal to the artist and his works that will make it useful as a book of reference. The exact size of each painting is given, its chief features and characteristics are noted, and attendant circumstances are related in a concise but attractive manner. The catalogue also contains an engraving from the portrait of Wright, by himself, in the National Portrait Gallery, London.

SOUTHPORT.

ONE of the most remarkable features of the present day is the continual growth of watering-places. Whether it is on the east or south coasts, we have developments at Saltburn and Scarborough, Hastings and Brighton, whilst on the west Blackpool and others make great headway, but not the least progressive is Southport. A hundred years ago it was composed of only a "few straggling cottages, half buried in the sandhills surrounding them." But before half the century had passed it had taken the first step towards its present fame, and was for that time a "fashionable bathing-place." It is true that its hotel accommodation was limited to four hotels; that the population of the whole of its parish,—2,763 in the year 1821,—had risen to 5,132 in the following decade; that it had fair baths and a fine assembly and news room; but the place was far from being what it now is. It depended upon coaches,—two daily in the season to Liverpool, and four to Manchester, and others to Preston. There was one episcopal church and three places of worship for Nonconformists; there were no banks, but some thirty lodging-houses added to the accommodation that the inns afforded, and the town was then in the state of slow growth that some of the much younger health resorts of to-day are now. In the fifty years that have passed the town did not so greatly increase in the early part of that period, but latterly it has shot ahead with greater rapidity, and its population ten years ago was nearly fourfold what it was at the last date for which we have given the figures, whilst at the time of the last census it had the remarkable increase to record to 42,000, and it is estimated that a considerable further enlargement has since taken place. Much of this growth is due to the excellent railway facilities that it has, which, however, are still to be increased. The Southport and Cheshire Lines Exteusion Railway Company proposes to tap the great towns that are served by the Cheshire lines and the three great railway companies that form them, and a very considerable progress has been made with the works, though it is not three years since the passing of the Act that authorised the formation of the new company.

In the later period to which we have referred, spurred on by the increase of the population, by the enlarged number of visitors to the town and by the competition that prevails amongst the West Coast watering-places, Southport has not only made great strides, but it may be said that the town has known a large amount of physical change. The beach presents a long stretch of noble buildings, prominent among which are the Pavilion and Winter-gardens, the Baths, and the Convalescent Hospital. Places of worship for all denominations now abound in the town; a free library and museum, botanic gardens, and other like institutions add to the attractions that it offers; and in the glaciarum, baths, gardens, promenades, and other features that attract to health resorts of the country, Southport has much to offer to residents and visitors; nor has the effect of the works that have been carried out, and of an efficient system of local self-government, been in vain, for the town boasts now of a very low death-rate. At a recent meeting of the Town Council the mayor was able to state that the death-rate was 16·42, and that "excluding the moribund visitors brought into the town to die, the death-rate for Southport was 13·72." It is to be expected that a town of its character should be healthier than great manufacturing centres; but the fact that one with so large a population as it has should have a death-rate that is so low must be said to be a fact that is creditable to the governing authorities. It is largely on the repute of the health resorts for the possession of that,—as shown in low death-rates,—that their prosperity depends, and hence it may be concluded that there is still greater growth before the West Coast watering-place. It has what may be called a very rich gathering-ground near it,—great centres of population, to give to it residents and visitors; and on these and on a wider area it will increasingly draw when the railway works now in progress are completed. To the visitors it can offer varied accommodation, from hotels that may be called palatial, down to much less costly homes. For these visitors it increasingly caters, and that with apparent success, and it is almost certain that, with better trade, there will be greatly-increased numbers of visitors, who long for a look at the sea, and an experience of the life-giving properties of its breezes. All our watering-places feel more or less the influence of the condition of commerce, and in the past few years that condition has been such that there has been with many temporary dulness. Southport, by continued additions to its attractions, seems to have suffered as little as any, and hence it may be believed that the rate of its future progress will seem the more surprising.

EXTENSION WORKS AT FENCHURCH STREET RAILWAY STATION.

THE constantly-increasing traffic at the Fenchurch Railway Station, which is alike the metropolitan terminus of the Great Eastern, the London, Tilbury, and Southend, and the London and Blackwall companies, has necessitated the enlargement of the station to more than double its former area. The works, which have been in progress for upwards of two years, embrace the lengthening of the station eastward as far as the Minories, and it is now upwards of 1,000 ft. long from the entrance to the offices in London-street to its eastern boundary. Simultaneously with the lengthening of the station it has likewise been widened to the extent of 50 ft., and now covers an area of nearly seven acres. In order to carry out the extensions it was necessary to purchase a considerable amount of property, and the whole of Gould-square and a part of Cooper's-row and John-street, have been absorbed into the station. One of the heaviest portions of the work was the removal of the old bridge crossing over Cooper's-row, and the erection of an entirely new bridge, in carrying out the widening of the station area. This bridge is of unusually great strength. It is composed of massive iron girders, and outside box girders, an immense main girder of 118 ft. in length, which forms the strongest part of the bridge crossing over Crutched Friars and Cooper's-row at the junction of those thoroughfares. The difficulties in carrying out this portion of the works were added to by the necessity which the engineer and contractors were under of prosecuting the undertaking without interfering with the traffic. From this bridge to the eastern boundary of the station at the Minories, the station is continued on a series of arches. With the view of relieving the booking arrangements at the entrance in London-street, an entirely new and distinct set of booking and general offices have been erected in John-street, from which the railway platforms above are reached by flights of stairs. These offices admit of passengers in the locality around the Minories availing themselves of the railway without going to the old Fenchurch-street entrance. Additional lines of rails have been laid down, and several new platforms constructed, one of these, which is approached from the new booking-offices and waiting-rooms in John-street, being 850 ft. in length.

In connexion with the works a new and spacious signal-box has been erected at the Minories approach to the station, and was opened last week. The structure, which runs parallel with the line, and at a considerable elevation over it, is supported by strong wrought-iron girders crossing the line, a circular staircase, and a gallery on the north side (also crossing over the line) serving as an approach to the interior. The signal-box contains 120 levers, supplied by Messrs. Saxby & Farmer. A short distance eastward beyond the signal-box a turntable, 50 ft. in diameter, is at present in course of construction. It is being erected under the south-east angle of what, until recently, were the London and St. Katharine Dock warehouses, but which now belong to the railway company. As the turn-table will occupy a space under the warehouses, and on the railway level, its erection involves the removal, and what may be described as the underpinning of the lower portion of the walls of the warehouses at this point, the superstructure above, when the brickwork of the walls is removed, resting upon massive iron girders. Langley's patent hydraulic buffer-stops for the protection of the trains have been fixed at the station. They are the invention of Mr. Langley, the Company's engineer, under whose superintendence the whole of the works have been carried out. With these buffers there is no recoil or rebound as with the ordinary spring buffers. Five sets of the buffers have been introduced.

The whole of the frontage of the station at Fenchurch-street has been re-faced, and an ornamental covered approach erected. New and greatly enlarged booking-offices are also now in course of erection on the ground-floor, whilst above, on the railway level, spacious waiting-rooms and refreshment-rooms are likewise being constructed.

The contractors for the new station buildings in John-street were Messrs. Perry, of the Tredegar Works, Bow; whilst for the new bridge, already referred to, the works eastward to the Minories, and the new booking-offices and waiting-rooms now in progress, Messrs. Bangs & Co. are the contractors.

PROGRESS OF THE MERSEY TUNNEL RAILWAY.

AT the half-yearly meeting of the shareholders in the Mersey Railway, which has just been held at the Westminster Palace Hotel, the chairman (the Right Hon. Cecil Raikes, M.P.), made some very encouraging statements as to the progress which was being made with the works. He said that the drainage heading of the tunnel had, since August, been advanced 726 yards, taking both ends of it. He added that the heading was a circular one, and 7 ft. in diameter. The amount of it which was under the river on both sides was equal to 200 yards, as against 11 yards in August last. He further stated that the main tunnel, which was 26 ft. wide, and 21 ft. high, had also made very considerable progress both at the Liverpool and at the Birkenhead ends. At Liverpool 498 yards had been effected, and at Birkenhead 574 yards, making together 1,072 yards. This, he observed included the underground stations, which were each of them 400 ft. long, 51 ft. wide, and 32 ft. high. Although, of course, the main tunnel had not made quite the same progress between the shafts that the drainage heading had, it was only about 100 yards behind it, and that whereas the drainage heading had now been made between the shafts for 726 yards, out of the total of 1,769 yards, the main tunnel had progressed within those limits, to the amount of about 620 yards, and was well under the river at both ends. Respecting operations he remarked that arrangements had been made by the contractors with Colonel Beaumont for the use of his machinery, which was expected to be at work at the Birkenhead end about the commencement of April, and Colonel Beaumont was satisfied, from the result of recent trials which he had made on the spot upon the rock through which he would have to bore, that he would be able to complete 40 or 50 yards weekly, and should he be successful in carrying out this expectation they might anticipate that in little more than six months he would have effected a junction between the drainage-heading on the Birkenhead and that on the Liverpool side, and that there would be by that time a passage under the river. It was further stated that the tunnel and the drainage-heading were both being lined with brickwork, 2 ft. 3 in. in thickness, laid in cement. The chairman concluded by expressing his confident belief, founded on the opinion of Messrs. Brunlees & Fox, the engineers, that the railway will be completed and opened about the middle of next year.

A junction with the Great Western Railway at Birkenhead will give that company direct access to Liverpool, whilst similar junctions on the Liverpool side will place the Midland, Great Northern, and Lancashire and Yorkshire companies in communication with Birkenhead.

Sydney.—A technological, industrial, and sanitary museum is being formed in Sydney, the management of it being in the hands of an influential committee. Fresh premises since the fire have now been secured, and active efforts are being made to form an entirely new museum. This museum is intended to occupy a similar position and fulfil the same purpose in this colony which the South Kensington Museum, the Bethnal Green Museum, the Museum of Practical Geology, the Patent Office Museum, and the Parkes Museum of Hygiene do in London. To this end it is intended to collect together typical collections of all materials of economic value belonging to the animal, vegetable, and mineral kingdoms, from the raw material through the various stages of manufacture, to the final product or finished article ready for use.

PRUSSIAN CHURCH-BUILDING STATISTICS.

A RETURN lately issued at Berlin gives the following details relating to public edifices built in several parts of the country during the ten years 1871—1880:—

	Churches.	Cost.
East Prussia	8	£28,500
West Prussia	9	33,600
Brandenburg	33	101,500
Pomerania	15	32,800
Posen	5	8,600
Silesia	4	14,600
Prussian Saxony	16	40,600
Hanover	1	4,400
Westphalia	3	10,300
Rhineland	2	11,800
Total	95	£286,700

The above figures indicate the cost of building, but do not include the acquisition of the sites nor any special incidental expenses. It is also remarked that this list only embraces churches which have been erected by the State, and that restorations and rebuildings, as well as structures costing less than 500*l*., have been omitted, as their being included would not be of any distinct statistical value. An analysis of the other details furnished indicates a somewhat extensive divergence of the cost per sitting,—this figure varying from 2*l*. 10s. to 15*l*. Plans of the various churches are also published as a part of this comprehensive report, the scale being 1 to 1,000. It is proposed to issue similar returns as to hospitals, schools, Government buildings, &c.

THE GROSVENOR BRIDGE, TUNBRIDGE WELLS.

THIS bridge, opened on the 7th inst. by Mrs. J. Stone Wigg, wife of the Chairman of the Tunbridge Wells Improvement Commissioners, commences at the northern end of Quarry-road, at a junction with St. James's-road, and extends over the South-Eastern Railway to Upper Grosvenor-road to a junction with Dunstan-road. It has been carried out from the plans and under the superintendence of Mr. W. Brentnall, engineer.

The work was let in two contracts,—Mr. Henry Potter, of London, being the contractor for the brickwork, roadway, and paths; and the Tank and Boiler Company, Wolverhampton, the contractors for the ironwork. The work was commenced on January 5th, 1881. The total length of the bridge, including the approaches, is 195 yards, and the width between the parapet-walls is 34 ft. The footpaths, which are laid with tar pavement and lined with iron kerb, are 8 ft. wide; and the carriage-way, which is made of native gravel and Sevenoaks stone, is 18 ft. wide; and the carriage-way over the girders is laid with creosoted red wood blocks with mastic joints resting on cement concrete. The parapet-walls are built with red bricks, with Bramley Fall stone coping, and the abutments and piers are built with red bricks, with Staffordshire blue brick facings and Bramley Fall stone pier caps. At each of the approaches there are three arches of 12 ft. span, extending the whole width of the roadway, which are intended to be let as store-rooms. A good roadway has been made to the entrance of the arches at the southern approach, which are also within easy access of the South-Eastern Railway Compahy's sidings.

The bridge is divided into three spans of 50 ft., 98 ft., and 78 ft. respectively, and the ironwork is supported on abutments and two piers, 6 ft. thick, the whole width of the roadway. The piers have a good concrete foundation, the depth of concrete at No. 1 pier being 10 ft. 6 in., and at pier No. 2 18 ft. 6 in. The greatest depth from the railway metals to the foundation is 25 ft., and the greatest depth from the centre of the carriage-way on the bridge to the foundation is 43 ft. 6 in., the clear height between the railway metals and the under-side of the girders being 16 ft. 10 in. The length of ironwork is 81⅓ yards, and consists of two continuous box-girders, 8 ft. high, with flanges 2 ft. wide. At the abutments and pier No. 1 the girders rest on rollers, to allow for contraction and expansion. The girder over the 98 ft. span has a camber of 3 in., and the other girders have a camber in the same proportion. There are also fifty-two cross girders 34 ft. long each, being hung to the main girders with sixteen 1-in. bolts. To the cross girders are riveted buckled plates, having a layer of cement concrete for the reception of the red wood blocks. The whole of the ironwork will be painted with four coats of the Torbay anti-corrosive paint.

BUILDING PATENT RECORD.*

APPLICATIONS FOR LETTERS PATENT.

1,265. T. C. Olney, Manchester. Hot-water apparatus for heating buildings. March 9, 1883.

1,268. R. Corner, Dresden. Adjustable window flower-stands. March 9, 1883.

1,271. C. K. Lawton, Manchester. Sanitary closets. March 9, 1883.

1,282. G. E. Mineard and T. Crapper, London. Ventilating house-drains and warming houses. March 10, 1883.

1,302. R. Whiston, Wolverhampton. Fastenings for doors, windows, and shutters. March 12, 1883.

1,317. J. Harsant, London. Apparatus connected with the handle of a closet for preventing waste of water. March 13, 1883.

1,337. T. J. Saunders and H. W. Allan, Glasgow. Baths, &c. March 13, 1883.

1,363. J. Imray, London. Compound applicable in cement or bricks, tiles, slabs, &c. (Com. by E. Pick, Paris.) March 14, 1883.

1,372. J. E. Rendle and F. B. Rendle, London. Glazed structures for horticultural and other purposes. March 14, 1883.

1,406. W. Jones, Bangor. Flushing apparatus. March 16, 1883.

1,426. G. Gore, Balsall Heath. Domestic stoves, &c. March 17, 1883.

1,451. J. H. Johnson, London. Manufacture of Portland cement. (Com. by E. J. de Smedt, Washington, and R. W. Lesley, Philadelphia, U.S.A.) March 20, 1883.

1,457. E. H. Harris, London. Portable or removable conservatories, greenhouses, &c. March 20, 1883.

1,488. A. M. Clark, London. Construction of stable drains and floors. (Com. by P. A. H. Basserie, Le Mans, France.) March 21, 1883.

1,489. G. F. Deacon, Liverpool. Detection of waste of water from water-mains, &c. March 21, 1883.

1,502. W. P. Buchan, Glasgow. Ventilating, &c. March 22, 1883.

1,505. F. L. Jeyes, London. Fan or ventilator. March 22, 1883.

1,506. E. Verity and J. M. Verity, Leeds. Holding in position swing windows, ventilators, &c. March 22, 1883.

1,513. R. M. Ordish, London. Pavements, &c. March 22, 1883.

1,514. W. Whittle, Whitehaven. Warming "explosive stores" and other buildings. March 22, 1883.

NOTICES TO PROCEED

have been given by the following applicants on the dates named:—

March 13, 1883.

5,760. J. H. Johnson, London. Bricks and blocks for building purposes. (Com. by J. Darrigan, Vagnotte, France.) December 2, 1882.

March 16, 1883.

5,435. C. R. Stevens, Lewisham. Apparatus for heating and ventilating, &c. November 14, 1882.

March 20, 1883.

5,581. E. Hughes, Liverpool. Wood block and other pavements, &c. November 23, 1882.

March 23, 1883.

5,508. L. A. Grotte, London. Producing architectural ornaments, wall and ceiling decorations, &c., from wood and other pulp. (Com. by C. G. Mineur, Stockholm.) November 20, 1882.

712. G. Ermen, Holcombe. Fireplaces, stoves, or grates. February 9, 1883.

ABRIDGMENTS OF SPECIFICATIONS.

Published during the Week ending March 10, 1883.

3,486. J. Leather, Liverpool. Ventilating appliances. July 22, 1882. Price 6d.

These consist of a box fitted outside the wall or window, &c., with apertures to allow the air to pass through into the room, which apertures are fitted with movable doors, actuated from inside.

3,511. W. Wright, Plymouth. Flush-cisterns, &c. July 24, 1882. Price 6d.

The float is used to shut off the supply of water, as in a ball-valve, and the same float can be pulled down into the water, to start the syphonic action which empties the cistern.

3,554. J. L. Thomson, Worcester. Ventilators. July 26, 1882. Price 2d.

This is a corbel, fitted internally with a number of air-passages, having an upward inclination, and radiating from the interior to the exterior. (*Pro. Pro.*)

3,573. A. L. Liberty, London. Ornamental windows and other translucent objects. July 27, 1882. Price 2d.

The reticulated lattice-frame, of any ornamental character, has V-shaped grooves in its salient angles, in which the pieces of glass are held. (*Pro. Pro.*)

3,702. L. Roth, Wetzlar, Germany. Manufacture of cement. Aug. 3, 1882. Price 4d.

This cement is made by grinding and burning a mixture of Bauxite quartz, hydrated silicic acid, blast-furnace slag, and lime.

4,679. J. D. Lampard and F. Croppen, London. Hack cap or cover for protecting bricks from rain. Oct. 2, 1882. Price 6d.

The two parts of the cover are hinged together and kept in position by hinged stays, over the middle joint of which is a telescopic slide, to keep the stay extended.

Published during the week ending March 24, 1883.

3,416. T. J. Baker, Newark. Chimney-tops or ventilators. July 18, 1882. Price 6d.

These are formed of tapering deflecting plates, having openings between their edges, to create the draught.

3,565. H. Morris, Manchester. Apparatus for adjusting ventilators. July 27, 1882. Price 6d.

This consists of a tube, containing oil or glycerine, &c., at one end of which is a plunger. As the oil or glycerine expands under the influence of heat, the plunger is lifted, and through levers and rods opens the ventilator.

3,613. A. C. Henderson, London. Stoves for heating by a combination of hot air and water. (Com. by Besson & Co., Paris.) July 31, 1882. Price 6d.

In the lower part of a cylindrical case is the fireplace, to which the coal is fed from the top. Round this feeding-flue are other flues, for air, which are surrounded by water. The water is heated by the fire, and the air passing through the flues is heated by the water.

3,688. W. Thomson, Shaw. Door-knobs. Aug. 2, 1882. Price 6d.

The knob is passed over the spindle, and a cavity is made in the knob, in which a nut screws on the end of the spindle. This cavity is afterwards closed.

3,719. W. H. Avis, Polegate. Folding seats for counter, desk, &c. Aug. 4, 1882. Price 6d.

The seat is fixed on a bracket pivoted against the counter, &c., and supported by a bar secured to the under side of the seat, the lower end of which travels in a guide-plate fixed on the side of the counter, &c., below the bracket.

3,737. B. J. Mill, London. Ceramic composition. (Com. by F. Gillet, Paris.) Aug. 5, 1882. Price 4d.

This is composed of lava and scoriæ, pulverised with fluxes and clays.

3,741. A Bonquié, Paris. Manufacture of bricks, tiles, pavings, &c. Aug. 5, 1882. Price 4d.

These are made of sand and tar or pitch, boiled into a plastic mass, when they are moulded, and then dipped into a bath of water, saturated with sulphate of iron mixed with red or yellow ochre.

3,796. W. J. Hinde, London. Apparatus for supporting and fixing swing looking-glasses, fanlights, &c. Aug. 9, 1882. Price 6d.

The axis on which the glass turns has a disc-like head, with the central portion cut away, to form a rim round the same. In the standard is a pin, with a strong bow-spring behind it, which engages slots in the rim, and secures the glass, &c. in the desired position.

* Compiled by Hart & Co., Patent Agents, 186, Fleet-street.

COUNTRY HOUSES.

WE understand that the drains at Wynnstay, the well-known seat of Sir Watkin Wynne, are to be thoroughly overhauled. There seems reason to suppose that the attack of diphtheria to which Miss Necta Williams Wynne, Sir Watkin's youngest daughter, recently fell a victim, was the result of a bad sanitary condition of the house, and that Sir Watkin's own serious and prostrate illness during the winter was partly, at any rate, due to the same cause. This seems to be another instance of the truth of our recent remarks on the sanitary condition of country houses, which we believe, as a rule, to be thoroughly bad. Wynnstay is a comparatively new house, having been erected after the fire in 1858, which destroyed the old mansion.

Royal Society.—The annual *conversazione* will be held on Wednesday, April 25th. On the 4th prox. the President will hold an informal reception, at which presentations may be made by Fellows.

ARCHITECTS' ASSISTANTS AS CLERKS OF WORKS.

SIR,—One or two of your recent correspondents seem hardly to view in its true light the question of the employment of architects' assistants as clerks of works. There is no doubt of the necessity for fully-qualified and experienced clerks of works upon large and important buildings. There is no doubt either of the value to an architect of a practical experience upon works in progress. What I maintain, and also stated at the Architectural Association, amounts to this, that an energetic architect's assistant (or even a pupil) may make a very good clerk of works. This statement applies to works of medium size, and presupposes a fair amount of supervision by the architect.

I have seen cases where this course has been adopted with good results; everything, however, depends in this case, as in all others, upon the kind of man selected for the post. No one would think of appointing a manifestly helpless and ignorant novice. I by no means wish to suggest that the distinct calling of a clerk of works should no longer exist.

ARTHUR J. GALE.

THE DECORATION OF THE DOME OF ST. PAUL'S.

SIR,—Mr. Samuel Huggins, if he will turn to my letter in the *Builder* of the 17th inst., and keep close to facts instead of indulging in fancy, will find that that letter was not specially written to rebut his fallacies regarding the above subject, but also those of other correspondents; neither his name nor his initials were referred to. I believe, however, that one of his great points was the insistance on the preservation of the hemisphericity of the dome "intact," "unbroken." But I showed in my previous letter that neither the Roman architect nor Wren considered this to be a principle that should be rigorously observed in designing this architectural feature, as is demonstrated by their admission of openings in the domes of the Pantheon and of St. Paul's. Moreover, I pointed out that deep panelling was, in the first instance, projected, even if it were not carried out, by Wren, similar to that adopted in the dome of the Pantheon, in order to break up the smooth monotony of an intact and unbroken hemisphericity. Mr. Huggins was also opposed to the division of the dome into eight compartments by pilasters or ribs, when there is proof positive, both in the original design as well as in Thornhill's decoration, that Wren approved of this arrangement. The Roman architect, too, admitted "stiles" or ribs into the dome of the Pantheon. Mr. Huggins cannot adduce a single substantiated fact to support his assertion that Wren disapproved of those eight dividing ribs. Neither does your correspondent's poetical figure of speech, "vault of heaven," assist him one iota, for that vault is intangible, and is without known limitation: it is mere darkness visible; secondly, it is "patined" with stars at very varying distances; thirdly, its girdle or springing limits of the world is very irregular; and fourthly, and finally it is ribbed with rays of light, and with clouds, so that neither nature nor art concedes the principle of an unbroken and even hemispherity as an element of design.

A PAINTER.

*** The correspondence must end here, at least for the present.

THE DECORATIVE ARTS.

SIR,—In an article under the title of "The Twin Arts," in the *Builder* of March 24th, I was surprised to find that the old English fallacy about "Decoration" being of lesser stature than Painting, Sculpture, and Architecture is not even "scotched," much less killed. Why, the two principal of the triad, nay! we might say the triad of arts, are, when at their best, decorative arts. It is most extraordinary that this fallacy should be so frequently reiterated in the face of such facts as the following:—1. That the Phidian sculptures of the Parthenon were decorative works, and the better part of the Parthenon,—that the architecture of the Parthenon was designed expressly as a "setting" for those magnificent works,—that Phidias had all the tektones, even the architektone, placed under his control. 2. That the famous frescos of Michelangelo are decorative works—are the chief glories of the Sistine. 3. That the frescos by Raffaelle in the Vatican,—the "Miracle of Bolsena," the "School of Athens," the "Dispute of the Sacrament," &c.,—are decorative works, and the chief ornaments of the Vatican. Here, then, we have enumerated the three greatest glories of ancient and Mediæval art. Are these, forsooth, to be included in that decorative art which the writer of the article referred to is pleased to call the art of "lesser stature"?

What is the use of lectures on the history of art when we find the fact ignored that painting and sculpture were at their highest when they were decorative arts? Isolated pictures on panel and on canvas were the exception during the great period of Italian art. Easel pictures increased in number with the "Decadence," which was really the decadence of mural painting, and gradually became the rule in Holland, Spain, France, and England.

The modern exhibition of pictures is of comparatively recent growth; it represents the fine arts destitute of any grand, collective, purpose.

It is the modern architect who has degraded decoration to the level of a "lesser art." He has desired to have something subordinate, and under his control: hence the propaganda of a flat treatment of figure subjects; he will persist, in fact, in having something in the way of painting which is imperfect in treatment; he would have his artists degraded to the rank of stencillers. Hence it is that the painter and the sculptor proper are excluded from their grand field of display.

As for the word "plastic," that has been used for years on the Continent as a general term for the formative arts.

METER.

THE SMOKE ABATEMENT COMMITTEE'S EXPERIMENTS.

SIR,—Kindly permit me to add a few words supplementary to the letter from Mr. Coles, the Honorary Secretary to the Committee, which appeared in your issue of last week.

Mr. Frederick Edwards is in error on a few points of detail. The test-houses at South Kensington were thoroughly repaired and reconstructed for the purposes of the tests conducted by me for the Smoke Abatement Committee. They are constructed entirely of concrete, excepting the roof, which is of wood, and there is not a single brick in the whole structure. The chimneys or flues are round, $8\frac{3}{4}$ in. in diameter, and are surmounted by a few feet of 6-in. zinc pipe, and Mr. Edwards does not attempt to produce an atom of proof in support of his assertion that they were too small for properly testing coal-burning grates; except by implication when he states that "all ordinary chimneys measure 14 in. by 9 in." When one reflects that a brick measures 9 in. long, and a brick and a half 14 in. long, it is easy to see that these dimensions are convenient for flues constructed in brickwork; and, whilst they make it possible for a human being to pass through them, they no doubt compensate in a manner for tortuosities of flues in house-walls; although when such flues are lined with $\frac{1}{2}$ in. of cement, their dimensions are reduced to 13 in. by 8 in. But there are many instances of round house-flues 9 in. in diameter. Such things as dimensions of this kind are matter of routine; and Mr. Edwards must be aware that the throats of chimneys and the vents of grates are frequently contracted to have an area much less than the section of an $8\frac{3}{4}$-in. round chimney. The chimneys at South Kensington were, it is true, contracted at the upper part to a diameter of 6 in. But he knows, I suppose, that ordinary chimneys are often contracted in the same way, at the top, by pots, cans, or pipes; and it is a mark of disingenuousness on his part to have ignored the practice of contracting the flue thoroughfare at the top as well as at the bottom.

As a matter of fact, the draught at South Kensington was good at all times, even during the stormiest weather last year. As another matter of fact, corroborated by the results of the tests, the draught in the rooms employed for testing grates at the Manchester Smoke Abatement Exhibition, where the comparatively tortuous chimneys were 14 in. wide by 14 in. in section, was not a bit better than the draught at South Kensington, with the $8\frac{3}{4}$-in. straight chimney. By reference to the official report, it will be seen that, in the grates which happened to have been tested both at South Kensington and at Manchester, the fuel was consumed practically at the same rates per hour. Taking averages, indeed, it was consumed rather more freely at South Kensington than at Manchester. It can be proved in another way that the draughts were equally good. The grates that were tested at both places had an average velocity of upward draught at the rate of 411 ft. per minute, at South Kensington, in the $8\frac{3}{4}$-in. straight chimney; but at Manchester the average upward velocity, in the 14-in. tortuous chimney, was only 130 ft. per minute. These velocities of draught, singular to say, are almost precisely in the inverse ratio of the sectional areas of the chimneys, which are 60 square inches and 196 square inches respectively; and the volumes of draught per minute are respectively:—

$8\frac{3}{4}$-in. chimney $(60 \div 144 \times 411 =)$ 171 cubic feet per minute.

14-in. chimney $(196 \div 144 \times 130 =)$ 177 cubic feet per minute.

Here it is seen that volumes of draught are very nearly equal. The volume is a trifle the less,—about 3 per cent.,—in the $8\frac{3}{4}$-in. chimney, and this is accounted for by the fact that the average temperature in the smaller chimney was 210°, against 223° in the larger chimney.

I have thus demonstrated that there is not a pin to choose between the smaller and the larger chimney, for the purpose of the tests; and I am of opinion that my ounce of fact outweighs Mr. Edwards's pound of rhodomontade. His baseless insinuations with respect to individual members of the Smoke Abatement Committee needed only to be uttered to be repudiated. I may remind your readers that he, as an exhibitor, did not receive any award from the Committee.

D. K. CLARK, M.Inst. C.E.
Testing Engineer to the Smoke Abatement Committee.

THE STREET MEMORIAL.

SIR,—May I appeal to all who love and honour Street's memory to help towards completing his monument, by Mr. Armstead, in the Great Hall of the Courts of Justice? The complete design includes a statue, with an appropriate and symbolical pedestal. But for the latter our means are still deficient. At the recent Committee meeting, however, we resolved, on the motion of the Prince of Wales, not to acquiesce in a half success, but to make a vigorous push to fulfil our work in its completeness by raising the still needful 600*l*. Our friends' contributions should be sent to the treasurer, A. Waterhouse, esq., 20, New Cavendish-street, W.

A. J. B. BERESFORD HOPE.

THE DURABILITY OF WOOD IN BUILDINGS.

HERR WEISE, Forest-inspector at Eberswalde (Germany), has recently published a summary of his observations bearing on the above subject. He considers that the system now usual for the supply of wood is in some measure to blame for the complaints which are from time to time made by experienced authorities, as to the reduced durability of modern wood-work. He remarks that in the Middle Ages the whole of the wood for any large building was carefully selected from one spot, and after being felled was stored and dried together, a certain homogeneousness in the woodwork being thus obtained. Nowadays wood is used just as it is delivered by the dealer, coming from various districts and having been felled at different seasons; these circumstances causing a more or less marked divergence in quality. He remarks that the first tendency towards decomposition shows the disadvantage of using various qualities of wood together, and calls attention to the fact that microscopic observation of the approach of decomposition is not by any means as much used as it might be. He considers that the development of agriculture and the neglect of the judicious extension of forests, have exercised an unfavourable influence upon the quality of wood in modern times. In illustration of this assertion he cites the fact that trees yielding 35-inch planks (such as are to be found in the castle of Fuessen) can only be exceptionally found even in forests under Government control.

Yarmouth.—The new municipal buildings here are said to be still in a state of subsidence. We understood that remedial measures had been adopted some little time ago.

PATENT TIP VAN FOR VESTRIES.

A DESIDERATUM with surveyors and contractors is a good tip-wagon, which will combine strength with lightness, give a good tip, so as to shoot the stickiest and heaviest mud without hesitation, and generally be handy to work, and not liable to derangement. Many makers have endeavoured to supply this want with more or less success, and amongst them, Messrs. Glover & Sons, of the Eagle Works, Warwick. Their tip-van having been a decided success, this firm have now made a tipping-cart upon the same principle. One of this firm's tip-wagons and a tip-cart were tested last week in the yard of the St. George's (Hanover-square) Committee of Works, Pimlico-road, in the presence of Mr. Livingstone, surveyor to the Committee. The wagon was loaded with ordinary street sweepings, backed to the shoot, and then tipped. In this wagon the tip is gradual, the body being lifted by means of a rack with gearing fitted in the centre, which is put in motion by a winch handle. The action is steady throughout the tip, and there is no jolting motion when the body has passed the vertical, as is to be found in the ordinary chain-gear wagons, a matter of some considerable importance, since it necessarily adds to the life of the wagon. The gearing of Messrs. Glover's wagon is placed well out of the way of dirt, and the more fully to ensure this, the body is boarded lengthwise, the joints being made to come exactly over the timbers of the framework, so that no dirt can get through.

The tip-cart (which is acceptable for road-making or patching) is so arranged that the man in charge of the horse can regulate the tip with ease. Mr. Glover showed how this could be done with a load of stones, the amount of each tip being easily regulated from the front of the cart. Altogether the trials were considered successful by those present. Messrs. Glover's wagon has been adopted by several London Vestries and Boards of Works.

NEW BUILDINGS ON THE SITE OF ST. DIONIS BACKCHURCH.

A FEW years since the ancient ecclesiastical edifice at the corner of Fenchurch-street and Lime-street, known as the Church of St. Dionis Backchurch, was taken down, and the site afterwards sold for 46,000*l.* Upon this site a costly pile of buildings for commercial purposes has for some time past been in course of erection, in Portland stone, and is now almost completed. The principal frontage of the building, which is of a decorative character, is that in Lime-street. The ground-floor of this elevation contains four shops with a mezzanine floor immediately above. The shops are divided by polished grey granite pilasters, resting on red Aberdeen granite bases. The central entrance to the offices in the upper portions of the building is a specially prominent and striking feature in the structure. On each side of the entrance there are double fluted grey granite pilasters on red Aberdeen granite bases, and having capitals in bronze, continued to the top of the mezzanine-floor windows. These pilasters face massive Portland stone piers, which support a carved entablature and pediment. These again are surmounted by a massive overhanging cornice resting on cantilevers, and above this is a balcony, enclosed by balustrade shafts, with vases at each angle. The entire height of the entrance, which is carried up to the floor above the mezzanine, is 24 ft. above the ground-line. Over the balcony the central portion of the elevation is continued by double pilasters and capitals, which are again surmounted by an arched pediment, ornamented by a profusion of carving and foliage. On each side of this pediment are the two three-light windows of the first floor, divided by covered shafts and capitals. Up to the top of the first floor the frontage is 74 ft. in length, but on arriving at the second story the frontage is narrowed to 39 ft. in length, being set back on each side to a depth of 9 ft., with a lead flat, inclosed by ornamental iron railing with bases at each angle. The arrangement of the foliage was rendered necessary in order not to inferfere with some ancient lights in the buildings immediately opposite. The third floor consists of pediment dormers in a mansard roof, and the elevation is finally surmounted by a richly-carved tympanum above the central entrance. The framework of the windows and entrances to the shops, and also the windows of the mezzanine floor, are in richly-carved oak. The Fenchurch-street frontage, overlooking the old churchyard, which is to be retained as an open area, is 64 ft. in length. It is generally uniform with the Lime-street elevation, although somewhat plainer in character. At present, however, it is to a considerable extent obscured by some unsightly one-story shanties immediately fronting Fenchurch-street. The west end portion of the ground-floor of this frontage contains a range of four windows and an entrance, approached from Fenchurch-street. This entrance leads into a spacious apartment on the ground-floor, 65 ft. in length and 32 ft. in width, which is intended to be occupied by Messrs. Huntley & Palmer, the well-known biscuit manufacturers, of Reading. It is about 20 ft. in height, and has a massive coved cornice, with a ceiling specially designed by the architect. This ceiling, which is of diaper work, has been executed by Messrs. Hitchens & Co., under their patent system of fibrous plaster. The apartment is being fitted in oak wainscoting. The construction of the basement formed a difficult portion of the work. In order to get good foundations it was necessary to go to a depth of 27 ft. below the street line. From the basement floor to the ceiling it is 16 ft. in depth. It consists of one large apartment, covering the entire ground area of the building, the walls being faced with white glazed brick, in view of its being ultimately occupied as a restaurant. The ground and first floors of the building are fire-proof, constructed by Messrs. Dennett & Ingle with their fire-proof materials.

Mr. Collins, of Old Broad-street, is the architect, and Messrs. Merritt & Ashby are the contractors. Mr. J. Robinson is clerk of the works. The carving and sculpture have been executed by Mr. Sansom, of Kennington. The cost of the building will be about 40,000*l.*, which, with the purchase of the site, amouuts to a total cost of 86,000*l.*

COMPENSATION CASES.

ARNOLD AND MORRIS *v.* THE METROPOLITAN AND DISTRICT RAILWAY COMPANIES.

THIS was a case which occupied two days in the Lord Mayor's Court, before the Recorder and a special jury.

The claimants are the occupiers of a portion of the premises 42 and 43, Mark-lane, and 68 and 69, Great Tower-street, a commanding building at the corner of those streets, where they carry on the business of stationers, bookbinders, and printers, holding under a lease for a term of twenty-one years from Michaelmas, 1879, at a rent of 1,100*l.* a year, the landlord paying rates and taxes. The claim for the leasehold interest, trade disturbance, fixtures, removal of stock, &c., was 18,000*l.*

Sir Hardinge Giffard, Q.C., M.P., and Mr. Channell appeared for the claimants; and Mr. Bidder, Q.C., and Mr. Sutton for the railway companies.

The jury having inspected the premises in question, and also some new premises taken by the claimants,

Sir Hardinge Giffard opened the case. He said that the jury having viewed the premises taken from the claimants and those to which they were going, it removed the matter of speculation as to whether new premises could be obtained. The great distinction between the two sets of premises was in the area and the amount of light. A brilliant light was a most essential thing for the proper carrying on of the claimants' business. The old premises were particularly well lighted, having a large frontage, whereas the new premises were not nearly so well lighted, and the frontage was much smaller. The difference was as 90 is to 30. The claimants were removing from the very centre of their business to a position away from their customers. With regard to the leasehold value there were 16¾ years to run.

Mr. W. J. Morris, one of the claimants, having given evidence,

Mr. W. H. Hardy, chartered accountant, said he had examined the claimants' books, and he found the net annual profit to be 5,284*l.* The net profits for 1881 were 7,286*l.* before deducting interest on capital, which would made them about 6,000*l.*

Mr. R. Ellis, surveyor (Messrs. Ellis & Sons), Fenchurch-street, took the letting value of the premises in question at 1,350*l.* a year, which, deducting the head rent of 1,100*l.*, left a profit rental of 250*l.*, and that he capitalised at ten and one-third years' purchase, giving the value of the sixteen and three-quarter years unexpired at 2,583*l.*; from that he deducted 500*l.* for necessary alterations in order to obtain the increased rental, leaving 2,083*l.*, to which he added 10 per cent. for forced sale, 208*l.*, bringing the total to 2,291*l.*

Mr. T. Chatfeild Clarke, architect and surveyor, Bishopsgate-street, took the letting value of the premises at 1,400*l.* a year; deducting from that the amount of the head rent, left an improved rent of 300*l.*; which, capitalised at ten and a quarter years' purchase, made 3,075*l.*; but from that he deducted 500*l.* for cost of necessary alterations, leaving 2,575*l.* to which he added the usual 10 per cent. for forced sale, 257*l.*, making a total of 2,832*l.* for the valuation of the claimants' interest in the premises.

Several other witnesses were called for the claimants.

For the company, Mr. Edmund Farmer (Debenham, Tewson, Farmer, & Bridgewater), Cheapside, estimated the full letting value of the premises occupied by the claimants at 1,105*l.* a year. He had made no valuation as to the amount of compensation to which the claimants were entitled.

Mr. G. Trist (Norton, Trist, & Watney) estimated the full rental value of the premises at 1,100*l.* a year. That was the sum he estimated them at in 1879, when the claimants applied for a renewal of their lease. He had not been asked what compensation the claimants were entitled to.

Mr. P. St. Quintin agreed with the last witness as to the rental value.

Mr. Robert Ritchie, surveyor to the railway company, said he was the purchaser for the company in all the cases connected with the extension of their line. He had bought the freehold of the whole of these premises, being more than what the claimants occupied, for 37,400*l.* That was based upon the actual net rentals of 1,700*l.* taken at twenty years' purchase.

The jury awarded the sum of 5,456*l.* 14s.

RIGHT OF BUILDING TO SUPPORT FROM ADJACENT LAND.

FIELD AND CO. *v.* JONES AND WILLIS.

IN the Chancery Division of the High Court of Justice on the 16th inst., a motion was made *ex parte* on behalf of the plaintiffs, before Mr. Justice Kay, to restrain the defendants from excavating from a piece of land on the east side of the plaintiffs' warehouse, Edmund-street, Birmingham.

Mr. Robinson, Q.C., said he made the motion *ex parte* under the following circumstances:—The plaintiffs were Messrs. Field & Co., of Birmingham, and the defendants Messrs. Jones & Willis. The plaintiffs were the lessees of a piece of land facing Edmund-street, Birmingham, upon which they had erected a large warehouse, 65 ft. high and 90 ft. long. Upon the east side of the warehouse was land of which the defendants were the tenants, which was vacant. The defendants had recently commenced excavating their land for the purpose of erecting some kind of a building upon it, and the plaintiffs accordingly saw the defendants on the 6th of March, and told them that what was being done was endangering the safety of their warehouse. The architects on both sides made an examination, and came to the conclusion that something must be done to support the plaintiffs' warehouse. Accordingly the defendants put up props in the usual way against the plaintiffs' warehouse. The plaintiffs made an examination on the 15th inst., when they found that between the 6th and 15th of March the defendants had excavated earth to a depth of 14 ft. or 15 ft. all over the vacant piece of land, and had also dug a trench 3 ft. deep at one end for the purpose of making the foundations, making the excavation 17 ft. deep in parts. The props which had been put up were not sufficient to support the plaintiffs' warehouse, and therefore the plaintiffs now came and asked for an injunction restraining the defendants and their servants and agents from excavating or removing any more soil.

Mr. Justice Kay.—Has your warehouse stood for more than twenty years?

Mr. Robinson, Q.C., said it had not. Both the plaintiffs and defendants held under the same landlord, and the title of the plaintiffs was earlier than the title of the defendants.

Mr. Justice Kay.—Then you say it is a derogation of the grant to you?

Mr. Robinson, Q.C., said that would be the plaintiffs' contention. In the eleventh paragraph of the affidavit he had stated that, having regard to the character of the plaintiffs' building and the height of the wall, which exceeded 65 ft., and having regard to the depth of the excavations already made by the defendants, it was of vital importance that further precautions should be taken to ensure the safety of the warehouse and the protection of life?

Mr. Justice Kay.—Who makes the affidavit?

Mr. Robinson, Q.C.—Mr. James Narrington, architect and surveyor, of Birmingham.

Mr. Justice Kay.—I suppose he means to say that any further excavations would endanger life, but he does not say so in explicit terms.

Mr. Robinson said that was so.

Mr. Justice Kay granted an interim injunction.

Ventilation.—Messrs. Robert Boyle & Son are at present applying their system of ventilation to Westminster School and Ashburnham House, Westminster; Boys' Home, Regent's Park; new public Offices, Kimberley, Cape Colony; new Somerset Hospital, Cape Town; Wesleyan Garrison Chapel School, Malta; and "Fairhill," Tonbridge, Kent, seat of the Earl of Derby.

"A DOCTOR'S HOUSE, BEDFORD PARK."

SIR,—Our attention having been attracted by the correspondence in your journal under the above heading, in which reference is made to our system of warming and ventilating, we desire, in justice to ourselves, to make a few observations on the subject in question. The leading features of the apparatus erected at Dr. Hogg's residence are clearly identical with those appertaining to our own apparatus, which produces a constant influx of fresh air from the exterior of the building, warmed to an appreciable degree by contact with heating surfaces fixed in a warm air-chamber, and a concurrent abstraction of the vitiated air from the rooms to be operated upon. This combined system of warming and ventilation was devised by our predecessor, Mr. H. C. Price, in the year 1829, more than half a century ago, consequently it cannot be considered a novel introduction, as would appear from the description given in your journal of the 3rd February last; and thus the remarks considerately made by "Architectus" were quite compatible with the circumstances of the case, and not so unjust and unfounded as Mr. May imputes in his letter published in your last issue. Mr. May apparently challenges proof of where our system has been adopted. We may therefore mention that twenty of our apparatus are in operation at Windsor Castle and twelve at Board Schools in London, and many hundreds have been applied to various other important mansions and public buildings throughout the kingdom.

H. C. PRICE, LEA, & Co.

CHURCH-BUILDING NEWS.

Newport (*Shropshire*).—At a meeting of parishioners held last autumn a committee was appointed to raise subscriptions for the restoration of the parish church, and to obtain the services of a competent architect to advise as to a general scheme of restoration and the probable cost. The committee have engaged Mr. Norton, of London, who has thoroughly investigated the fabric, and the probable cost of the restoration, according to his report, will amount to 3,710*l*. The committee having perused and considered the report and plans, recommend that the structural work be done at once, but decided that certain ornamental work and the removal of the plaster panels and roofs of the aisles should be postponed. The cost of the work proposed to be doue now will amount to 2,000*l*. The committee's report was adopted.

Kew.—At the Consistorial Court of Rochester, held on the 24th ult. in the vestry of the parish church of Greenwich, the Chancellor (Dr. Robertson) had before him an application by the vicar and churchwardens of Kew. It is proposed to pull down the Mausoleum, which contains, amongst others, the body of his Royal Highness the Duke of Cambridge, and to re-erect it more to the eastward, to add to the church a chancel and sacrarium, and a north transept and a south porch. Some of the parishioners had opposed the issuing of the faculty, but at the last moment they withdrew their opposition. The estimated cost of the proposed alterations is 5,000*l*. After hearing the arguments, the Chancellor decreed the faculty to issue unconditionally, unless an appeal should be prosecuted within fifteen days. Messrs. Stock are the architects concerned. Some account of the history of the church was recently given in our columns.

Canterbury Diocesan Church Building Society.—At a meeting of the Central Committee of the Canterbury Diocesan Church Building and Endowment Society, held a few days ago at the residence of Earl Sydney, 3, Cleveland-square, St. James's, Earl Sydney in the chair, the following grants were made:—150*l*. towards building a new church at Bromley; 100*l*. towards restoring and enlarging the church of Wateringbury; and 100*l*. towards enlarging the vicarage house at Woodnesborough.

Sproxton.—The Church of St. Bartholomew, Sproxton, has just been thoroughly restored in accordance with the style of the edifice, which is principally Perpendicular, a large portion of it having been rebuilt. The tower, which is a square one and embattled, and terminating at the angles with crocketed pinnacles, has had its roof shored up, and walls taken down and rebuilt to level of bell-floor, iron ties being inserted; a panel stone has been fixed on the south side of the parapet, the whole of the walls thoroughly cleansed and re-pointed, and about 3 ft. 6 in. of its moulded base have been uncovered and exposed to view, adding much to the beauty of the tower. The nave roof (partly new in 1860) has been entirely lined, and the principals strengthened with the moulded ribs springing from the old stone corbels, which originally carried a handsome oak roof; and a moulded string-course has been inserted under the clearstory windows. The aisle oak roof has been renewed, and some good carved spandrels and bosses, which were carefully preserved from the former roof, inserted. Part of the aisle was originally a chapel with a squinch, which has been opened and restored, and 4 ft. of the side walls and both end walls have been rebuilt. The chancel arch and jambs are entirely new, except two old carved caps which have been refixed. The chancel roof is entirely new, and consists of two moulded principals springing from carved corbels; the old roof was of a very inferior description. The south wall has been rebuilt, and an organ-chamber arch, a vestry door, and a two-light window inserted. Under the chancel arch a very rich Riga oak screen has been erected, the tracery having been carefully copied from a portion of the original screen found in the church. This work adds much to the beauty of the building. A pair of wrought-iron gates of good design has also been fitted to the same. The reredos consists of an alabaster shelf, the centre panel and angle shafts above are also of alabaster. The pulpit is of bold design in stone, having a semicircular shaft springing from a cluster of columns, the centre panel of the shaft having a raised cross. The font has been refixed on a new platform. The flooring consists of Minton's tiles in the chancel, and the old stone paving refixed in the nave and aisles. The porch has had to be entirely rebuilt and a new roof added. Combe Down Bath stone, from the quarries of Messrs. Pictor & Sons, has been used in the work. Several stone coffins were found during the work of restoration; also remains of dog-tooth arch stones and strings. The whole of the work has been done at the sole expense of the Rev. A. W. Booker, of Croxton Kerrial, the former vicar of the parish, at a cost of about 2,400*l*., by Mr. Thomas Woolston, contractor, of Recreation-road, Stamford; the architect being Mr. H. Woodyer, of Grafham, Guildford.

Affpuddle.—The restoration of the Parish Church of Affpuddle was carried out under the direction of the late Mr. T. H. Wyatt some eight or nine years ago. Much of the nave was then reseated after the ancient models existing, but this was not entirely effected. Funds have now been raised for placing carved oaken benches in the nave as far as the western tower. The old benches in the edifice are of somewhat unique construction, exceedingly massive, and of quaint design. There is a strong Flemish feeling about the ornamentation upon them. The new seats recently placed in the church, with their elaborately-carved bench-ends, have been made by Mr. Harry Hems, of Exeter.

STAINED GLASS.

Norwell.—An effective window has recently been inserted in the south aisle of Norwell Church (near Newark-on-Trent) by desire of the late Mr. A. C. Dennistoun, of Carlton Hall, who after requesting that the figure of St. John the Evangelist should occupy the central light, he having been born on St. John's Day, left the subjects to the vicar, who made choice of the following, and entrusted the work to Messrs. Lavers, Barraud, & Westlake, of Endell-street, Bloomsbury, London. In the centre is a full-length figure of St. John. Underneath are the figures of St. Peter and John healing the sick man at the Beautiful Gate of the Temple. On the right at the top is St. John in a caldron of boiling oil at the Porta Latina, from which he miraculously escaped unhurt, being afterwards banished by the tyrant to the island of Patmos. The lower compartment on the left represents the beloved disciple on that lonely isle, beholding the heavenly vision of the multitude which no man can number, who are portrayed in the upper portion. The remaining compartment on the right shows the aged Apostle at Ephesus.

Gloucester Cathedral.—Mr. F. S. Waller has just now issued, under the title "Notes and Sketches for Visitors," some cheap guides, with a view to assist visitors on their tour round the cathedral, and that they may take away with them some useful general memoranda of the building. A plan and numerous details are given in artistical style, and all for 1d., any profits arising from their sale being devoted to the Restoration Fund. The name of Waller in connexion with architecture has long been known, if we mistake not, in Gloucester. We can remember that, when a boy, making a tour of the English cathedrals, we were kindly received there and aided in our views by one of that name.

Books.

Amateur Work. Edited by the author of "Every Man his Own Mechanic." Containing designs, sketches, and working drawings, and 500 wood engravings. Ward, Lock, & Co., Salisbury-square, London.

THIS work will be found eminently serviceable to those who are not above soiling their hands in performing various mechanical works as a source of domestic convenience and comfort. It is extraordinary what any one with a practical mind and disposition towards neatness and order can do with a few tools and a proportional supply of screws, nails, and glue. The breaking-up of furniture and other domestic articles, before becoming quite useless, generally commences with a slight want of repair, and the old adage, "A stitch in time," being forgotten or delayed, they soon reach such a state that a professional,—who generally takes more time in moving about than in executing the job,—is unwillingly called in to do that which the amateur could himself have performed at an earlier stage, and agreeably utilised his spare moments. As the liking advanced so would the skill, and from the early repairs,—which may be called the stoppage of destruction,—useful and ornamental work would be taken in hand, and be found productive of pleasure where care was taken in its execution. Besides, in some cases mechanical knowledge may turn out to be a source of a livelihood. As the editor states in his introduction,—"The clerk, the curate, and the struggling professional man and the man of letters, who in many cases are well up in theory, and know why this, that, and the other are and should be done in the ordinary trades, and who can even offer suggestions worth having to mechanics when at work, finding themselves, of late years, falling to the rear, as far as position, political status, and worldly progress are concerned, are beginning to try to help themselves, and to this end are seeking practical instruction in what may be not inaptly expressed as the how, and when, and in what way to do it." The volume before us, which does not complete the work, is such as will supply much practical instruction. It includes among the many illustrations detail drawings to scale and the various tools required. For the more advanced amateur instructive help is given for the making of a small organ, cabinets, bookshelves, chairs, tables, summer-houses and green-houses, bookbinding, &c. Parts are for readers of a more scientific turn of mind, such as electro-plating at home, modelling in clay and plaster of Paris, violin-making, electric-light, photography, and so on. Short histories of the various subjects precede the details.

Woolrych's Metropolitan Building Acts, with Clauses from the Metropolis Management Acts. With Notes and Terms, by W. H. MACNAMARA, Barrister-at-Law, and Registrar to the Railway Commissioners. Third Edition. London: Stevens & Sons. 1882.

THE pressure of matter on our space has hitherto prevented us from giving a notice of the third edition of this well-known work. It is really so well-established a work that it hardly needs any mention at our hands. The most important addition to the present edition is the Metropolis Management and Building Acts Amendment Act, 1882, which contains several important provisions, with which those who are concerned with buildings in the Metropolis have to make themselves acquainted. The most obvious conclusion to be drawn from this book is, however, that the time has arrived when the several Acts which deal with buildings in the metropolis should be consolidated into one plain and symmetrical statute. It is preposterous that there should exist five Building Acts and four Metropolis Management Acts, which contain the law on this subject, together with a certain number of judicial decisions. The point is so important that we may return to it on another occasion; meanwhile we may safely recommend this new edition to those who have to find their way among these statutes.

Liability of School Boards in Scotland.—The Court of Session has awarded 150*l*. damages, and costs, to the parents of a girl who sustained severe injuries by the fall of a schoolhouse at Pollokshields.

Miscellanea.

Effects of Disruptive Explosions on Glass.—From the grievous piece of wickedness recently perpetrated at Charles-street, Westminster, some interesting particulars are to be gathered as regards the effects of an explosion. Strong and massive objects were shattered to pieces, while delicate and fragile articles were in several instances left untouched. It is stated to have been no uncommon thing in Paris during the siege of 1871, when numbers of tombs were blown up in the cemetery of Père la Chaise, to find that while heavy slabs of stone and marble were riven in pieces, glass vials of immortelles altogether escaped. Many similar instances were noticed amongst the *débris* at the Local Government Board offices. In a bedroom close adjoining the spot where this ligno-dynamite was fired was a substantial clothes press which was split into matchwood, while a toilet bottle and glass on the mantelpiece were left unchanged. The glass face of the clock over the fireplace had been blown off, but the glass of a little picture hanging close by was intact. Similarly, the companion picture to the one just mentioned had been torn from its hook, and been flung it is impossible to say where. We are reminded of the conditions of the explosion of gunpowder in a barge on the north side of Regent's Park early one morning about ten years ago. The window glass was broken up over a very considerable area, and in some cases under circumstances that were at once unusual and curious. We have in our possession a piece of a window of an artist friend. All the windows in his house were blown out, and those in his studio were made of thick glass about five-sixteenths of an inch in thickness. These were blown out also in slabs about 6 in. long and 2¾ in. or 3 in. broad. The piece we refer to is of this size, and is traversed by four cracks which run lengthwise along it about ⅛ in. or ¼ in. apart, and extending nearly half through the thickness of the glass. Many questions suggest themselves: why do not they go through the glass; what determines the distances between them; and why are they parallel? We have not heard whether any glass broken at Westminster showed these characteristics, but it would be a matter of great interest to record it.—*The Engineer*.

The Organ at Canterbury Cathedral.—We have received a letter from Dr. Longhurst, the Precincts, Canterbury, the organist of the cathedral, giving a statement of the condition of the organ. The instrument is supposed to have been built in 1661, and rebuilt in 1753 and 1784. Seven pedal pipes were added by James Longhurst in 1825, and the organ was finally rebuilt and a few additions made by W. Hill in 1841. It is considered by musical judges unfit for the performance of much of the music which the improved services of the cathedral require, and as it has none of those mechanical contrivances which add to the ease, and, therefore, to the effect of performance, it is proposed to open a subscription for a new organ embodying the great and important improvements of which organ-building is now capable. During the last quarter of a century almost every cathedral organ of importance has either been rebuilt or superseded. It appears that Dr. Longhurst three years ago, with the sanction of the Dean and Chapter, started a subscription for a new organ. The list is headed by the Dean with 100*l*., and the total sum subscribed is 650*l*. The cost of an organ of the highest class, built by H. Willis, and cased in accordance with the designs of Sir Gilbert Scott, will be at least 3,150*l*.

The Raffaelle Commemoration. — The fourth centenary of the birth of Raffaelle was celebrated at Rome on Wednesday. Delegates from the municipalities of Rome and Urbino, and from many Italian and foreign artistic associations, including the French Academy, left the Capitol at ten o'clock in the morning for the Pantheon, where the remains of the great painter are interred. Conspicuous among the wreaths laid upon the tomb was one from the Royal Academy in London.

A Partnership.—Mr. Arthur J. Gale, of whose observations in America as holder of the first Godwin Bursary we have had occasion to speak, has joined Professor Roger Smith as his partner in the practice of the profession of an architect and surveyor. We shall be glad to find the association conducive to the welfare of both.

An Artistic Novelty.—Messrs. Wyman & Sons have issued with the *Printing Times and Lithographer* a photo-filigrane portrait of Senefelder, the inventor of lithography. At first sight the paper containing the portrait appears to be blank, but on holding it to the light the likeness is seen in a form which suggests the familiar water-mark. It is explained that the portrait is taken from a very old lithographic print, and that, therefore, it is an inadequate specimen of what can be done by a new process perfected by Messrs. Brown, Barnes, & Bell, of Liverpool. Watermarks are produced by designs in wire work, which are comparatively crude. "Filigrane" is the name given in France to linear paper, and paper with a checkered pattern. In photo-filigrane the result is produced by pressure between hard rollers, one of which is embossed by photographic means. The cost is small compared with water marking, and half tone and gradations are secured. The effects are produced by those parts of the photographically engraved design which are in relief, compressing the paper sufficiently to render the part so compressed more transparent to transmitted light, and darker in colour by reflected light. Among many suggested applications are wall-papers, visiting-cards, and book illustration by means of surface blocks to supersede wood engraving.

Society of Arts.—A course of three Cantor lectures on "The Decorative Treatment of Metal in Architecture," will be delivered by Mr. G. H. Birch, Assoc. R. Inst., B.A., at the Society of Arts, on Mondays, April 2, 9, and 16. The first lecture will deal with the decorative treatment of the precious metals in ancient architecture, and its occasional use in Egyptian, Assyrian, Babylonian, Mede, Persian, and Jewish architecture, as well as in Greece and Rome, and during the Christian dispensation. This will be followed by a reference to the bronze age; the nature and qualities of bronze; its earliest uses in Nineveh, Babylon, Mycenæ, Etruria, and during the Classic period. The subject of bronze will be continued in the second lecture, when its history will be carried to the culminating point during the Renaissance. The art of the blacksmith, and the use of wrought iron in the north of Europe will then be referred to. Iron work will be continued in the third lecture, and an account given of its development at Augsburg and Nuremberg in the 15th and 16th centuries, and in England in the 17th century. The artistic treatment of lead in the Middle Ages will then be considered; and in conclusion the lecturer will make some remarks on the use and abuse of metal work; on modern bronze work, on the decorative treatment of the metals, as applied in these days; and point to our failures and successes. An exhibition of metal work will be arranged in connexion with the lectures.

Coal Staithes at Middlesbrough.—At a recent meeting of the General Purposes Committee of the Middlesbro' Corporation, Ald. Dunning presiding, the Town Clerk reported that the sub-committee had met Mr. Smith and Mr. Cudworth, of the North-Eastern Railway, and discussed the question of further facilities for bunkering coals both in the river and at the dock. Mr. Cudworth showed a plan of larger staithes which the company were disposed to erect, but these were deemed inadequate, and in order that Mr. Cudworth might visit the Tyne to see some staithes there, which were of the exact type required at Middlesbro', the subject was ordered to stand over. Mr. McLachlan said the railway company were only going to make the staithe 12 ft. higher at the dock and 6 ft. higher in the river at the dock point, and that would be utterly useless. The Chairman, Mr. Barritt, and Mr. Rushford said they believed the railway company were disposed to meet the town as far as possible.

Ramsgate.—It is intended to construct some tidal-baths in Ramsgate, close to the new pier. The work will be commenced in a few weeks under the direction of Mr. A. R. Pite, architect. The iron roofs, which are to be semicircular, in one span, and other constructional ironwork, is entrusted to Mr. A. D. Dawnay, A.-M. Inst.C.E., for execution.

Large Blocks of Offices will shortly be erected in Barge-yard, Bucklersbury, from the designs of Mr. Jno. Whichcord, F.R.I.B.A., by Mr. Lawrance, contractor, of Wharf-road. The cast and wrought ironwork, which is of considerable extent, and fireproof corridors and lower floors, will be constructed by Mr. A. Dawnay, C.E.

Liverpool Free Library, Museum, and Art Gallery.—The Library and Museum Committee of the City Council have issued their annual report in regard to the above institutions, in which they state that the efficiency and interest of the institutions continue to be fully maintained. The increased facilities afforded by the completion of the Rotunda Lecture-room have been availed of to a large extent. Encouraged by the popularity of the lectures, it has been determined by the Council, on the motion of Mr. Stewart, to provide courses of similar lectures in other parts of the city. For this purpose a grant has recently been made by the City Council. The building for the extension of the Walker Art Gallery has made considerable progress, and it is expected it will be ready for opening during the current year. Reporting on the Mayer Museum, the committee state that during the past year two catalogues have been issued in this department of the museum, one of the pre-historic antiquities and ethnography, and the other of the Mediæval and later antiquities, including the Mather collection of objects relating to the Bonaparte family. A catalogue of the pottery and porcelain is now in course of preparation. Considerable additions have been made to the ethnographical department, and a permanent gallery for the ethnographical collection is being provided in the extension of the Walker Art Gallery.

A Reredos Dispute.—An excited parish meeting was lately held at Eccles, near Manchester, in reference to a proposal to replace the wooden reredos in the church with an alabaster one. The vicar (the Rev. Canon Pitcairn), who spoke for an hour, disclaimed any intention to introduce ritualistic practices, described himself as an Evangelical, and said that the supposed features of the design that were objected to would not be introduced. The design, he said, had the approval of the Bishop. Mr. Headlam, stipendiary magistrate of Manchester, moved a resolution approving the reredos. A parishioner moved that the application for the faculty be withdrawn. The vicar declined to receive the amendment. Amid great excitement he repeated that he should not put the amendment, and exclaimed, "For once I am master here!" The meeting then became uproarious, and a man hoisted a flag bearing the words, "Vote for the Amendment." A rush was made at him by the vicar's supporters, and he was defended by the opponents of the reredos. Chairs, tables, and seats were overturned, and a hand-to-hand fight ensued, in which several persons were bruised. The vicar and his principal supporters rushed out of the *mêlée* through an ante-room, and the meeting broke up in great disorder. The tattered flag was afterwards carried through the village by an excited crowd of the vicar's opponents.

Timber for the Future.—It is stated that there are no less than 40,000 square miles of almost unbroken forests in North Carolina—pine, chestnut, oak, maple, beech, and hickory timber, in their finest growth. Within the next ten years, it is estimated that the timber alone in North Carolina will exceed in value the present total valuation of all the property in the State, including land. The State grows 19 varieties of oak, and its pine forests are of the heaviest. New railroads are now in course of construction, and this will open up the whole region to the northern and eastern lumber markets.

The Casella-Goolden Doubly Adjustable Electrical Sixe's Thermometer. — This elaborately-christened instrument is particularly adapted for greenhouses, hospital wards, and sick-rooms, breweries, the ventilation of theatres and public buildings, and all cases where it is essential to preserve a uniform temperature. If the temperature either rises above or falls below the set limits, a bell is sounded or some other signal given at any desired distance from the instrument. It is claimed that this is the only accurate thermometer yet devised which can be made to give warning of an excess of both heat and cold.

Select Competition for the Colchester New Corn Exchange. — This has been recently decided, Mr. Chas. Forster Hayward, F.S.A., having been called in by the Committee to advise them as to the best of three selected by themselves, and marked respectively A, B, and C. The one deemed to be the most suitable was the work of Mr. Edward I'Anson, jun., who has accordingly been appointed to carry out the work.

The Hyde Park Changes.—At the meeting of the St. George's Committee of Works on the 20th inst., the surveyor, with reference to this matter, said that a portion of the Park would be thrown into the roadway of Piccadilly and widen it, giving a space of irregular shape about 357 square yards. At the present time it would be necessary to alter the levels of Piccadilly opposite Hamilton-place, and for that purpose the roadway would have to be taken up, the contractors paying the expenses. He thought it would be convenient to do the work in the Easter recess, and he asked for the necessary permission. This was given. The surveyor, with respect to the alterations in the Grosvenor-place roadway in connexion with this improvement, said that this would give an extra 771 square yards to the roadway. He also said that it might be necessary to take up the whole of the wood-paving opposite St. George's Hospital, in order to alter the levels in the proper manner. He requested permission to do the works which were required, stating that the Vestry would not be put to any expense. In answer to a question, the surveyor said that the contractors were bound to have the improvement ready by May Day.

Workmen in Paris.—The distress among the working-classes here is receiving attention. A committee appointed by the Prefect to study the problem of cheap dwellings for the poor has just sent in its report, which the Prefect has submitted to the Municipal Council. It proposes the adoption of a scheme which consists in granting certain advantages to proprietors who will build houses in which the rent of workmen's lodgings shall not exceed 300 francs per annum. Of course these lodgings must be constructed in accord with hygienic principles. The advantages would comprise a reduction of taxation, the reimbursement of the town dues paid on the material used in the building of the houses, the exemption from the highway tax, the gratuitous supply of water to be laid on in each lodging, and the reduction to 15 centimes per cubic mètre of the price of gas. In order to insure the building of a sufficiently large number of new and cheap workmen's houses, and to enable workmen's societies to construct them, it is also proposed that the Municipal Council should guarantee the interest on the money laid out in their construction. This is treading on dangerous ground.

Art in Birmingham.—An opportune addition to the recreative opportunities of holiday folk has been made at Birmingham this week by the opening of the Spring Water-Colour Exhibition of the Royal Society of Artists. Including some 250 oil-paintings, which are restricted to two galleries, and a small room full of etchings and studies in black and white, the collection comprises altogether some 900 works. Of these, the large majority are exhibited now for the first time; but a few of the choicest have been culled from recent Academy and other London exhibitions, or are lent for the purpose of the exhibition by private gallery owners. There are comparatively few works of dominant interest or excellence this time, but the average standard is satisfactory. A special feature of the exhibition is a collection of some 150 sketches and studies of the late Mr. Allen E. Everitt, the former honorary secretary of the exhibition, who was especially happy in interiors and architectural subjects.

The Sewerage of Sheffield.—The Sheffield Town Council have adopted the report presented by Mr. Gott, surveyor, for the completion of the sewering of the borough. About twenty-three acres of land have been obtained three miles below the town, and on this site it is proposed to deal with the sewage on the precipitation system, the effluent to pass into the river Don. The cost of the scheme is estimated at 150,000*l.*

Art Exhibition at Chester.—The Duke of Westminster has this week opened an Art Exhibition in the Town-hall, Chester, and the Duchess afterwards distributed prizes to the successful students in connexion with the Chester School of Art. Among the features of the exhibition is a collection of original sketches and drawings by Mr. John Ruskin.

A Reading Stand.—Mr. William Rees, of the Elthorne-road, Upper Holloway, has sent us a neat little Reading or Music Stand which deserves a word of notice. The upper part is a good specimen of fret-cutting, and the lower part, on which it stands, is so ingeniously hinged that, when folded, it will lie flat in a drawer or elsewhere without fear of damage.

Board Schools, South Shields.—The new Board schools at Laygate-lane, South Shields, have been opened. They are designed upon the class-room system, and will accommodate 762 children. The outlay, which includes caretaker's house, furniture, and heating apparatus, but exclusive of site, amounts to about 4,633*l.* We are informed that, although the foundation, which passed through an old quarry, had to be built up in places for nearly 30 ft., the cost has hardly exceeded 6*l.* per seat. These schools are built in the Queen Anne style, of red Sherburn brick with stone dressings, and owing to their contiguity to the Westoe suburb are a little ornate, and have brick pilasters, stone strings, and stone-pedimented gables. They are covered with green Westmoreland slates, and there is a lofty bell-turret on the summit of the roof. Large covered playgrounds have been provided, and every room has been heated. The contractor was Mr. A. Thompson, Mr. Lindsay being the clerk of the works. Messrs. Mather & Armstrong have fixed the steam heating apparatus. Messrs. Oliver & Leeson, of Newcastle-on-Tyne, were the architects.

Mr. Alfred Clint, late president of the Society of British Artists, died on the 22nd inst. at the age of seventy-six, after having ceased for about five years to exercise his profession owing to failure of sight. He acquired his technical knowledge of painting from his father, Geore Clint, then A.R.A., and he studied the living figure along with other members of a society of students in the Savoy. After trying portrait and landscape, he fixed on marine painting. He was one of the original members of the Society of British Artists, which was formed in consequence of a belief that the Royal Academy did not give sufficient space on its walls to landscape painters. After exhibiting in the Suffolk-street Gallery from its first opening, he succeeded Mr. Hurlstone as president, and on retiring was made honorary president.

The Sunday Society.—The eighth annual meeting of the members of the Sunday Society was held on Wednesday in the gallery, 9, Conduit-street, Professor Corfield in the chair. Mr. Mark H. Judge, hon. secretary, read the annual report. Professor Corfield proposed the adoption of the report, and spoke encouragingly of the work of the society. By confining themselves strictly to the one question of opening museums, art galleries, and libraries on Sundays, they were bringing together a body of opinion that must, before long, obtain for London what Manchester, Birmingham, and other provincial towns enjoyed. The report was seconded by Mr. H. Rutherford, barrister-at-law, and passed unanimously. Sir Coutts Lindsay was unanimously elected president of the society.

Manchester Cathedral.—A largely attended meeting was held on Wednesday in the Manchester Town-hall, under the presidency of the Mayor, for the purpose of considering the best means of completing the restoration of the Manchester Cathedral, and the mode of raising the necessary funds to carry out this object. On the proposition of the Bishop of Manchester, seconded by Lord Egerton, and supported by Mr. Grafton, M.P., a resolution was passed expressing the opinion that measures should be immediately taken to carry into effect the recommendation of the architect (Mr. J. S. Crowther) to restore the cathedral, and it was also resolved to make a public appeal to raise a fund of not less than 30,000*l.* The total amount of subscriptions announced was 13,244*l.*

Defective Iron Columns.—The coroner's inquiry into the circumstances of the lamentable accident at the Kingston Cotton Mills, Stockport, on the 16th inst., by which five men lost their lives, was resumed on Wednesday, and further adjourned to allow of the attendance of one of the injured men, now lying at Stockport Infirmary. Mr. Edward Potts, the architect from whose plans the alterations in the mill were being made at the time the accident happened, said in his opinion the fall of the roof was due to the faulty construction of the iron pillars which were used.

The Destruction of the Berlin Hygienic Exhibition, 1882.—At the recent trial of the workman charged with having caused the destruction last year of the Berlin Hygienic Exhibition, by carelessly throwing down a match, the accused was acquitted, the evidence having failed to establish, with sufficient clearness, the connexion between his careless proceeding and the fire which took place. The costs of his defence were defrayed by the State.

New Liberal Clubhouse at Derby.—When it was decided some time ago to establish a club in connexion with the Derby Liberal Association, the committee visited several premises in the town, but were unable to find any suitable for the purpose. Mr. Woodiwiss consequently consented to erect premises specially adapted for the club, and plans have been prepared by Mr. James Wright.

TENDERS.

For residence, Greta-street, Keswick, for Mr. W. Adair, of Maryport. Mr. T. Hartas, architect. Quantities by Mr. L. Campbell:—

Excavating, Bricklaying, Masonry, Slating, and Plastering.

T. & J. Hodgson	£711 13 0
T. Hodgson	627 0 7
J. Lawson*	567 2 0

Carpentry and Joinery.

J. D. Lancaster	£283 0 0
J. Scott	270 17 7
J. Milburn*	242 15 0

Plumbing, Gasfitting, and Bellhanging.

Mandle	£128 4 6
J. B. Banks	124 10 0
J. Dunbobbin*	113 16 1½

Painting and Glazing.

Wood	£66 6 8
Youdale	52 2 6
Hall*	38 17 2

* Accepted, subject to revision.

For business premises, Popham-street, Nottingham, for Mr. S. F. Armitage. Mr. T. Hartas, architect. Quantities by Mr. J. G. Petherick, B.A:—

Fisher Bros.	£2,583 10 0
J. Jelley & Co.	2,422 10 0
Dennett & Ingle	2,420 0 0
Ireson, Wade, & Gray	2,407 0 0
J. Shaw	2,397 0 0
G. Bell & Son	2,386 13 0
H. Vickers	2,309 5 6
J. F. Price	2,281 6 0
Lynam & Kidd (accepted)	2,262 0 0
J. Greenwood	2,260 0 0

For the erection of a villa residence, coach house, stables, &c., at Sidcup, Kent, for Mr. E. Eldridge:—

Eldridge & Gee (accepted)	£1,500 0 0

For the erection of boat house at the Oxford and Cambridge Inn, Kew Bridge, for the Royal Brewery, Brentford. Messrs. Smithies & Gladman, architects:—

J. Dorey, Brentford (accepted)	£680 0 0

For new shop front and fitting No. 81, Lower Marsh, for the International Tea Co. Messrs. Wylson & Long, architects:—

R. Lamprell (accepted)	£108 0 0

For alterations and fittings, No. 58, Regent-street, W., for Messrs. Phillips. Messrs. Wylson & Long, architects:—

R. Lamprell (accepted)	£182 0 0

For rebuilding the "Crown" Public-house, Old Cavendish-street, W., for Mr. Thomas Cannon. Mr. William Thomas Sams, architect. Quantities supplied by Messrs. J. & A. E. Bull:—

		Granite.*
Martin Wells & Co.	£3,600 0 0	£ 35 0 0
Hall, Beddall & Co.	3,494 0 0	90 0 0
Patman & Fotheringham	3,395 0 0	147 0 0
Gregory	3,320 0 0	185 0 0
Massey & Sons	3,275 0 0	200 0 0
Hook	3,240 0 0	180 0 0
Auley, John	3,230 0 0	220 0 0
Langmead & Way	3,170 0 0	170 0 0
Toms	3,046 0 0	194 0 0

* Add if pilasters are in Aberdeen granite in lieu of Corsehill stone.

For alterations to Warehouse for the City of London Brewery Company, Limited:—

Building.

T. Wontner Smith & Son, Isledon Works, Islington (accepted.)

Ironwork.

Thornewill & Warham, Burton-on-Trent (accepted.)

For Wood-paving, Great Yarmouth, at per yard super. Mr. J. W. Cockrill, Borough Surveyor:—

	With Auger-holes.	Without Auger-holes.
Bell, London	£0 17 5	...
Bray, Yarmouth	0 15 0	...
Beech & Cork, Yarmouth	0 12 9	0 12 1
Carey, London	0 12 6	...
Nudd Yarmouth	0 12 1	0 11 9
Youngs, Norwich	0 12 0	0 11 6
Batch, Norwich	0 11 10	0 11 5
Hayward, Eastbourne	0 11 3	0 10 6
Griffin & Wilson, Norwich (accepted)	0 10 10	0 9 6

For Drainage Works, Great Yarmouth. Mr. J. W. Cockrill, Borough Surveyor:—

Bell, London	£2,532 0 0 !
Cook, Bennett, & Thew, Lowestoft	2,065 0 0
Bray, Yarmouth	1,700 0 0
Youngs, Norwich	1,495 0 0
Cowdary & Son, Swindon, Wilts	1,348 0 0
Flaxman, Yarmouth	1,300 0 0
Beech and Cork, Yarmouth	1,299 0 0
T. Howes, Yarmouth	1,275 0 0
E. Howes, Yarmouth	1,225 0 0
Hayward, Eastbourne (accepted)	1,032 0 0 !

For villa, Crow-hill, Mansfield. Mr. Arthur Marshall, architect, Nottingham:—

J. Bulling, Ollerton	£2,190 0 0
H. Vickers, Nottingham	2,180 0 0
G. Hewitt, Leicester	1,899 0 0
Dudson & Parish, Nottingham	1,851 0 0
H. Alsop, Mansfield	1,800 0 0
A. Eastwood, Warsop (accepted)	1,670 0 0

For the erection of a receiving-house and casual-wards, for the Guardians of the Poor of the St. George's Union. Messrs. H. Saxon Snell & Sons, architects:—

Staines & Sons	£22,970	0	0
Bolding	22,787	0	0
Nightingale	21,870	0	0
Garlick	21,800	0	0
Wall Bros.	21,255	0	0
Adcock	21,000	0	0
Parker	21,0 0	0	0
Lucas & Son	20,990	0	0
Mowlem (accepted)	20,900	0	0
Peto Bros.	20,379	0	0

For alterations to the Hand-in-Hand public-house, New Park-road, Streatham. Mr. R. Cruwys, Bank-chambers, 451, Brixton-road, architect:—

Builder's Portion only.

Freight	£380	0	0
Canning & Mullins	369	0	0
Dodds & Robb	311	0	0
Le Gassick & Co.	286	0	0

Fittings and Pewterer's Work.
J. Warne (accepted).

Gasfittings.
Biggs (accepted).

For the erection of a new branch bank, Streatham, for the London and South-Western Banking Company, Limited. Mr. R. Cruwys, architect:—

Peto Bros.	£3,597	0	0
Walker	3,314	0	0
J. Macey	3,275	0	0
Maxwell, Bros.	3,180	0	0
Candler	3,150	0	0
Downs	3,137	0	0
J. Macey & Sons	2,996	0	0
Smith & Sons	2,896	0	0
Tyerman	2,810	0	0
Johnson (accepted)	2,789	0	0

For the extension of the Church-road Schools, Leyton, for the Leyton School Board. Mr. J. T. Newman, 2, Fencourt, architect. Quantities supplied by Messrs. R. Curtis & Sons:—

D. Sayer	£1,134	0	0
G. J. Hoskings	1,098	0	0
T. Harris	1,040	0	0
B. E. Nightingale	1,036	0	0
North Bros.	995	0	0
B. J. Wood	995	0	0
Thomerson & Son	979	0	0
J. Morter	963	0	0
J. Webb	959	0	0
A. Reed	955	0	0
C. Cox	920	0	0
W. Gregar	918	0	0
J. Holland	902	0	0
Hearle & Son (accepted)	872	0	0
G. Crabb	860	0	0
S. J. Scott (too late)	—		

For the extension of Kirkdale-road Schools, Leyton stone:—

G. J. Koskings	£2,588	0	0
T. Harris	2,493	0	0
B. J. Wood	2,387	0	0
D. Sayer	2,350	0	0
B. E. Nightingale	2,323	0	0
Thomerson & Son	2,250	0	0
North Bros.	2,220	0	0
J. Morter	2,117	0	0
A. Reed	2,100	0	0
C. Cox	2,077	0	0
Hearle & Son	2,073	0	0
J. Holland	2,026	0	0
J. Webb	1,975	0	0
W. Gregar (accepted)	1,948	0	0
G. Crabb	1,940	0	0
S. J. Scott (too late)	—		

For furniture at the Newport-road Schools, Leyton:—

H. & G. Edward	£696	12	6
Spencer & Co.	647	0	0
Wake & Dean	616	1	9
Educational Supply Association	605	0	0
Redmayne, May, & Co. (accepted)	600	0	0

For works at the Crown and Mitre Inn, Batt's-court, Taunton, for Mr. J. Brutton, The Brewery, Yeovil. Mr. W. H. Crease, architect, 2, Hammett-street, Taunton:—

Rowsell & Macey	£447	0	0
W. Potter	385	0	0
C. Fox	366	0	0
F. Ware	358	0	0
G. Handford	329	0	0
Morse & Woolfrey	307	0	0
J. Cure (accepted)	290	0	0
J. Lane	288	0	0

For Westbourne drainage:—

Ambrose & Co.	£5,230	0	0
J. Crosh & Co.	4,150	0	0
Noare & Walden	4,142	12	0
G. James	4,100	0	0
J. Young	3,933	0	0
J. Whettam (accepted)	3,545	0	0

For building a house in the Usher-road, Old Ford, for Mr. W. R. Dodson. Mr. Edward Brown, architect, 18, Hanbury-street, Spitalfields:—

Marr	£548	0	0
Salt	478	0	0
Lewin (accepted)	375	0	0
Harper	372	0	0

For alterations at the Duke of Wellington, Three Colts-lane, Bethnal-green, for Mr. R. Clarke. Mr. Edward Brown, architect:—

Shurmur	£540	0	0
Jackson & Todd	520	0	0
Hawkings	514	0	0
Marr (accepted)	500	0	0

Pewterer's Work.

Paddon	£82	10	0
Rogers (accepted)	81	17	0

For painting externally 64, Brook-street, for the Right Hon. Lord Penzance. Mr. John George Carey, architect, Windsor:—

E. Harris & Sons, London	£124	0	0
Haward Bros.	120	0	0
A. & J. W. Baldwin	120	0	0
A. J. Arrowsmith & Co.	120	0	0

[Noteworthy.]

For road-making, sewers, surface water drains, &c., on the Uplands Park Estate, Walthamstow, for Mr. H. Davis:—

Peill & Sons, Bromley, Kent	£1,480	0	0
Woodham & Fry, Greenwich	1,355	0	0
Dunmore, Hornsey	1,212	0	0
Bloomfield, Tottenham	1,201	11	0
Pizzey, Hornsey	1,197	0	0
Wilson, Walthamstow	1,160	0	0
Keeble, Regent's Park	1,160	0	0
Harris, Camberwell	1,150	0	0
Bell, Wood Green	1,119	0	0
Jackson, Leyton	1,088	0	0

For finishing two detached villa residences, Myrtle-crescent, Myrtle-road, Acton, for Mr. C. F. Allison. Mr. Alfred Wright, architect, Belgrave House, 199a, Brompton-road:—

Adamson & Son	£1,550	0	0
Burman & Sons	1,499	0	0
Tarrant & Son	1,486	0	0
Marsland	1,415	0	0
D. S. Rice	1,364	0	0
F. Higgs	1,280	0	0
Holliday & Greenwood	1,277	0	0
F. Bray	1,275	0	0
W. Johnson	1,222	0	0

For residence and stables at Elmstead-lane, Chislehurst, for Mr. W. Vaughan. Mr. George Lethbridge, architect. Quantities by Mr. C. H. Goode:—

Punnett & Son	£5,073	0	0
Patman & Fotheringham	4,993	0	0
Higgs & Hill	4,890	0	0
Harris & Wardrop	4,644	0	0
Adcock	4,583	0	0

For the erection of billiard-room, for Conservative Club, Blackheath:—

Kennard Bros. (accepted).

For the erection of a villa residence in Holmesdale-road, Hampton Wick, for Mr. H. P. Flavell. Messrs. Bray, Webb, & Co., architects:—

Wheatley	£935	0	0
Smith	848	0	0
Travers	847	0	0
Harris (accepted)	800	0	0

For detached house and studio, Chalcot-gardens, South Hampstead, for Mr. H. Ludlow. Messrs. Batterbury & Huxley, architects:—

Nightingale	£2,898	0	0
Holliday & Greenwood	2,799	0	0
Lathey Bros.	2,791	0	0
J. & J. Drew	2,779	0	0
Manley	2,629	0	0
Dixon, Highgate-road (accepted)	2,500	0	0

For furniture at the following schools for the West Ham School Board. Mr. J. T. Newman, architect:—

	North-street.	Clarkson-street.
Wake & Dean	£248 6 9	£245 13 0
H. & G. Edwards	247 14 0	243 13 8
Educational Supply Association	239 0 0	259 0 0
Spencer & Co.*	230 7 0	226 16 0

* Accepted.

For the erection of a detached house at Harold Wood, Essex, for Mr. J. Compton. Mr. J. T. Newman, architect. Quantities supplied by Messrs. R. L. Curtis & Sons:—

H. Wells	£5,100	0	0
A. Reed	4,935	0	0
Wey	4,570	0	0
J. Morter	4,433	0	0
Hearle & Son (accepted)	4,153	0	0

For alterations and additions to house, Oak Bank, Seal' near Sevenoaks, for Mr. James Alexander. Mr. John M. Hooker, architect. Quantities by Mr. Thomas Ladds:—

Mansfield	£3,035	0	0
Rider & Son	2,948	0	0
Grover	2,942	0	0
Wallis & Clements	2,864	0	0
Vaughan	2,747	0	0
Wiltshire	2,698	0	0
Avard	2,678	0	0

For pulling down and rebuilding entrance lodge, Hamptons, near Tunbridge, for Mr. Max H. Dalison. Mr. John M. Hooker, architect:—

Allcorn (accepted)	£300	0	0

For alterations to National schools, Dunton-green. Mr. John M. Hooker, architect:—

Wood	£300	0	0
Durtnall	244	0	0
Wiltshire	215	0	0
King	196	0	0

NOTICE TO ADVERTISERS.

Persons advertising in the *Builder* may have

REPLIES ADDRESSED TO THE OFFICE
46, Catherine-street, Covent-garden, W.C.,
FREE OF CHARGE.

Letters will be forwarded if addressed envelopes are sent, together with sufficient stamps to cover the postage.

TO CORRESPONDENTS.

Dr. M. (we are unable to comply).—F. (under consideration).—H. B. M.—G. P.—A. W.—S. B.—J. G. C.—R. B. & Son.—J. J.—C. H. G.—W. M. P.—L. B.—W. Y. B.—R. K.—J. H. M.—H. & Co.—S. C.—F. E.—J. S. G.—A. R.—W. R. M.—P. B.—A. D. D.—H. O'N.—R. A. P.—H. J. N.—E. & G.—S. & C.—C. F. H.—B. & H.—J. M. H.—N. E.—R. C.—R. W. H.—W. S. & Sons.—H. C. P. L.—J. & A. E. B.

Correspondents should address the Editor, and *not* the Publisher, except in cases of business.

All statements of facts, lists of tenders, &c. must be accompanied by the name and address of the sender, not necessarily for publication.

We are compelled to decline pointing out books and giving addresses.

NOTE.—The responsibility of signed articles, and papers read at public meetings, rests, of course, with the authors

Best Bath Stone.
WESTWOOD GROUND,
Box Ground, Combe Down,
Corsham Down,
And Farleigh Down.
RANDELL, SAUNDERS, & CO., Limited,
Corsham, Wilts. [ADVT.

Bath Stone.
Facilities for selection and quality unequalled, having upwards of
350,000 Feet Cube
In Stock of all known descriptions.
PICTOR & SONS, Box, Wilts. [ADVT.

Doulting Freestone and Ham Hill Stone of best quality, in blocks, or prepared ready for fixing. An inspection of the Doulting Quarries is respectfully solicited; and Architects and others are CAUTIONED against inferior stone. Prices, delivered to any part of the United Kingdom, given on application to CHARLES TRASK, Norton-sub-Hamdon, Ilminster, Somerset.—Agent, Mr. E. WILLIAMS, 73, Charlotte-street, Portland-place, W. [ADVT.

Doulting Freestone,
HAM HILL STONE,
BLUE LIAS LIME
(Ground or Lump),
Of best quality, supplied from their own Quarries and Kilns by STAPLE & HANN, Stoke, Ilminster. Agent, Mr. H. MITCHELL, 5, Augustus-road, Hammersmith, London, W. [ADVT.

Asphalte.
Seyssel, Patent Metallic Lava, and White Asphaltes.
M. STODART & CO.
Office:
No. 90, Cannon-street, E.C. [ADVT.

Asphalte.—The Seyssel and Metallic Lava Asphalte Company (Mr. H. Glenn), Office, 38, Poultry, E.C.—The best and cheapest materials for damp courses, railway arches, warehouse floors, flat roofs, stables, cow-sheds and milk-rooms, granaries, tun-rooms, and terraces. [ADVT.

Immense quantities of
DRY WAINSCOT,
DRY MAHOGANY,
DRY WALNUT,
in all thicknesses.
B. J. HUDSON & SONS,
Whitfield-st., W., and Great Peter-st., S.W.
London. [ADVT.

J. L. BACON & CO.,
MANUFACTURERS OF IMPROVED
STEAM AND HOT-WATER APPARATUS,
FOR WARMING AND VENTILATING
Private Houses, Churches, Schools, Hospitals, Manufactories, Greenhouses, &c.
OFFICES AND SHOW-ROOMS:—
No. 34, UPPER GLOUCESTER PLACE, DORSET SQUARE, LONDON, N.W.
And at DUBLIN, BELFAST, and NEWCASTLE
Illustrated Pamphlet on "Heating" post free.

CHARGES FOR ADVERTISEMENTS.

SITUATIONS VACANT, PARTNERSHIPS, APPRENTICESHIPS, TRADE, AND GENERAL ADVERTISEMENTS.

Six lines (about fifty words) or under	4s. 6d.
Each additional line (about ten words)	0s. 6d.

Terms for Series of Trade Advertisements, also for Special Advertisements on front page, Competitions, Contracts, Sales by Auction, &c. may be obtained on application to the Publisher.

SITUATIONS WANTED.

FOUR Lines (about THIRTY words) or under	2s. 6d.
Each additional line (about ten words)	0s. 6d.

PREPAYMENT IS ABSOLUTELY NECESSARY.

*** Stamps *must not* be sent, but all small sums should be remitted by Cash in Registered Letter or by Money Order, payable at the Post-office, Covent-garden, W.C. to

DOUGLAS FOURDRINIER, Publisher,
Addressed to No. 46, Catherine street, W.C.

Advertisements for the current week's issue must reach the Office before THREE o'clock p.m. on THURSDAY.

The Publisher cannot be responsible for DRAWINGS, TESTIMONIALS, &c. left at the Office in reply to Advertisements, and strongly recommends that of the latter COPIES ONLY should be sent

TERMS OF SUBSCRIPTION.

"THE BUILDER" is supplied DIRECT from the Office to residents in any part of the United Kingdom at the rate of 19s. per annum, PREPAID. Remittances payable to DOUGLAS FOURDRINIER, Publisher, 46, Catherine-street, W.C.